

Research and Development in Industry: 1993

**Funds, 1993
Scientists & Engineers,
January 1994**

Detailed Statistical Tables

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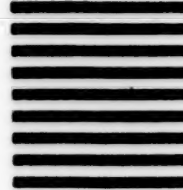
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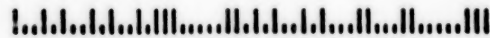
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GENERAL NOTES

This report provides statistics on research and development (R&D) funding for the years 1983–93 and on R&D personnel for the period from January 1984 to January 1994. The statistics are produced from results of the annual Survey of Industrial Research and Development and provide national estimates of the total expenditures on R&D performed within the United States by industrial firms, whether U.S. or foreign owned. It is a sample survey that intends to include or represent all R&D-performing companies, either publicly or privately held.

Every year a survey questionnaire is sent to all companies that spend more than \$1 million annually on R&D in the United States or that have 1,000 or more employees. These attributes are determined using information from previous surveys or other sources. Remaining firms are subjected to probability sampling and may or may not receive a questionnaire for a given survey year.

Industry statistics are developed from data collected from individual companies or enterprises. Since the survey is enterprise based rather than establishment based, all data collected for the various subparts of each enterprise (plants, divisions, or subdivisions) are tabulated in the major standard industrial classification (SIC) of the company. The resulting industry estimates are reported using the SIC of the companies within each industry. National totals are estimated by summing the industry estimates.

Several changes have been made to the survey recently that are of special importance to users of this report. Prior to the 1992 survey, statistics were based on samples selected at irregular intervals (i.e., 1967, 1971, 1976, 1981, 1987). In intervening years, a subset of the last sample (called a panel) was used. The most recent sample prior to the 1992 survey was for survey year 1987. Original estimates for 1988 through 1991 were based on surveys of approximately

1,700 panel companies that reported R&D activity in the 1987 survey. Beginning with the 1992 survey, statistics are based on samples selected annually. Also, beginning with the 1992 survey, the sample size was increased from approximately 14,000 to nearly 23,400 firms to account better for births of R&D-performing establishments; to more fully and accurately survey R&D performed by small firms in all industries and by nonmanufacturing firms, especially in the service sector, and gather more current information about potential R&D performers.

The Bureau of the Census, U.S. Department of Commerce, has conducted the annual Survey of Industrial Research and Development for the National Science Foundation (NSF) since 1957. Census staff conduct the survey under Title 13 of the United States Code, which prohibits publication or release of data or statistics that may reveal information about individual companies. Therefore, in some tables of this report the symbol (D) is used as a footnote reference to indicate that estimates are being withheld to avoid possible disclosure of information about operations of individual companies.

The tables containing statistics developed from the survey data are provided in section A. Detailed information about the history of the survey, survey methodology, comparability of the statistics, and survey definitions are provided in the technical notes in section B, and survey questionnaires, instructions, and other survey documents are reproduced in section C. Specific questions regarding the survey may be directed to Raymond Wolfe at (703) 306-1772, via e-mail at rwolfe@nsf.gov (Internet), or at the following mailing address:

Research and Development Statistics Program
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Note to Users of Historical Statistics

To obtain accurate historical statistics for 1983-1992, use only the detailed statistical tables in this report and not those published earlier. Current-year and immediate prior-year (1992 and 1993) statistics in trend tables were derived from the most recently completed survey cycle. Data for previous years (1983-1991) were reviewed for consistency with current-year responses and may have been revised. Consequently, this report contains the latest revised statistics from the Survey of Industrial Research and Development for 1983-1993.

Note particularly that, as a result of a new sample design, statistics for 1988-1991 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes in section B for more information.

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TABLE NOTES

CLASSIFICATION OF REPORTING UNITS

The basic reporting unit was the company or enterprise, which includes all establishments under common ownership or control. All research and development (R&D) expenditures and all scientists and engineers of each company were classified into a single standard industrial classification (SIC) code and size category.

COMPANY SIZE-CLASS

Companies are categorized by their total number of domestic employees. The following are the six company size-classes used in this report:

1. Fewer than 500 employees
2. 500 to 999 employees
3. 1,000 to 4,999 employees
4. 5,000 to 9,999 employees
5. 10,000 to 24,999 employees
6. 25,000 or more employees

CURRENT AND CONSTANT DOLLARS

Statistics in all tables are reported in terms of current dollars. Constant dollars are also presented in two summary trend tables, tables A-1 and A-25.

GEOGRAPHIC STATISTICS

The statistics cover only those operations located in the 50 states and the District of Columbia. Company-sponsored R&D performed outside the United States by foreign subsidiaries of U.S. domestic companies is included in table A-11 but is excluded from all other tables.

INDUSTRY CLASSIFICATION

An enterprise or company level SIC code was assigned to each company. A single SIC code was assigned to multiestablishment companies based on the code that represented the most dominant aggregated activity for that firm in terms of total payroll. Statistics for the following industry groupings are published in this report (SIC codes are shown in parentheses¹):

Food, kindred, and tobacco products (20,21)²
 Textiles and apparel (22,23)
 Lumber, wood products, and furniture (24,25)
 Paper and allied products (26)
 Chemicals and allied products (28)
 Industrial chemicals (281-82,286)
 Drugs and medicines (283)
 Other chemicals (284-85,287-89)
 Petroleum refining and extraction (13,29)
 Rubber products (30)
 Stone, clay, and glass products (32)
 Primary metals (33)
 Ferrous metals and products (331-32,3398-99)
 Nonferrous metals and products (333-36)
 Fabricated metal products (34)
 Machinery (35)
 Office, computing, and accounting machines (357)
 Other machinery, except electrical (351-56,358-59)
 Electrical equipment (36)
 Radio and TV receiving equipment (365)
 Communication equipment (366)
 Electronic components (367)
 Other electrical equipment (361-64,369)
 Transportation equipment (37)
 Motor vehicles and motor vehicles equipment (371)
 Other transportation equipment (373-75,379)
 Aircraft and missiles (372,376)³
 Professional and scientific instruments (38)
 Scientific and mechanical measuring instruments (381-82)
 Optical, surgical, photographic, and other instruments (384-87)
 Other manufacturing industries—printing and publishing (27), leather products (31), and miscellaneous manufacturing industries (39)

¹ When the 1993 sample was drawn, the 1987 revision of the SIC system was in effect.

² Until 1984, the tobacco products industry (SIC 21) was included with "other manufacturing industries."

³ Because of the close similarity of their R&D activities, companies primarily engaged in the manufacture of ordnance and accessories, including complete guided missiles, are grouped with companies primarily engaged in the manufacture of aircraft and parts.

Nonmanufacturing industries—agricultural services, forestry, fishing and hunting (07–09); mining (10,12–14); construction (15–17); transportation, communications, electric, gas, and sanitary services (40–42,44–49); wholesale and retail trade (50–59); finance, insurance, and real estate (60–65); holding and other investment offices (67); hotels and motels (701); business services (73); automotive repair, services, and parking and miscellaneous repair services (75–76); motion pictures and amusement and recreation services (78–79); health and legal services (80–81); social services (83); museums, art galleries, and botanical and zoological gardens (84); engineering, accounting, research, management, and related services (87); and miscellaneous services (89).

PERCENTAGES

Percentages were calculated on the basis of thousands of dollars and may differ from those calculated using the rounded figures shown.

ROUNDING

Because of rounding, detail may not add to totals.

SUPPRESSION OF STATISTICS

The Bureau of the Census conducts the survey under Title 13 of the United States Code, which prohibits

publication or release of data or statistics that may reveal information about individual companies. Also, missing data are imputed for some data items. Therefore, the data in some of the table cells may have been deleted and replaced with one of the following notations:

(D), which indicates that statistics are being withheld to avoid possible disclosure of information about operations of individual companies. This occurs when a small number of companies account for a large percentage of the R&D funds or scientists and engineers in a particular data cell. The tables most often affected by this rule are those that contain data on Federal support to companies for R&D performance.

(S), which indicates that the imputation rate—the percentage of the statistic not reported by respondents and consequently estimated—exceeds 50 percent for that item. See table B-4 in section B for imputation rates for specific items.

Although publication of certain cells may be withheld, the estimates in the cells are always included in totals. In some instances, cells withheld because of high imputation rates [notation (S)] can be derived by subtraction from higher level totals. In such cases the user should be aware that the derived numbers are statistically unreliable. In no instance can cells be derived that would disclose operations of individual companies [notation (D)].

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This is a comprehensive list of all tables in this publication. The list includes the detailed statistical tables in section A and the technical tables in section B.

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Year	Total R&D		Federal		Company 1/	
	Current dollars	Constant 1987 dollars	Current dollars	Constant 1987 dollars	Current dollars	Constant 1987 dollars
[Dollars in millions]						
1953.....	\$3,630	\$16,500	\$1,430	\$6,500	\$2,200	\$10,000
1954.....	4,070	18,333	1,750	7,883	2,320	10,450
1955.....	4,640	19,414	2,180	9,121	2,460	10,293
1956.....	6,675	27,987	3,328	14,102	3,277	13,886
1957.....	7,731	31,684	4,335	17,766	3,396	13,918
1958.....	8,389	33,691	4,759	19,112	3,630	14,578
1959.....	9,618	37,570	5,635	22,012	3,983	15,559
1960.....	10,509	40,419	6,081	23,388	4,428	17,031
1961.....	10,908	41,475	6,240	23,726	4,668	17,749
1962.....	11,464	42,617	6,434	23,918	5,029	18,695
1963.....	12,630	46,434	7,270	26,728	5,360	19,706
1964.....	13,512	48,780	7,720	27,870	5,792	20,910
1965.....	14,185	49,947	7,740	27,254	6,445	22,694
1966.....	15,548	52,884	8,332	28,340	7,216	24,544
1967.....	16,385	54,076	8,365	27,607	8,020	26,469
1968.....	17,429	54,808	8,560	26,918	8,869	27,890
1969.....	18,308	54,814	8,451	25,302	9,857	29,512
1970.....	18,067	51,327	7,779	22,099	10,288	29,227
1971.....	18,320	49,380	7,666	20,663	10,654	28,717
1972.....	19,552	50,392	8,017	20,662	11,535	29,729
1973.....	21,249	51,450	8,145	19,722	13,104	31,729
1974.....	22,887	50,973	8,220	18,307	14,667	32,686
1975.....	24,187	49,161	8,605	17,490	15,582	31,671
1976.....	26,997	51,620	9,561	18,281	17,436	33,338
1977.....	29,825	53,354	10,485	18,757	19,340	34,597
1978.....	33,304	55,231	11,189	18,556	22,115	36,675
1979.....	38,226	58,271	12,518	19,082	25,708	39,189
1980.....	44,505	62,071	14,029	19,566	30,476	42,505
1981.....	51,810	65,665	16,382	20,763	35,428	44,902
1982.....	58,650	69,988	18,545	22,130	40,105	47,858
1983.....	65,268	74,849	20,680	23,716	44,588	51,133
1984.....	74,800	82,198	23,396	25,710	51,404	56,488
1985.....	84,239	89,236	27,196	28,809	57,043	60,427
1986.....	87,823	90,633	27,891	28,783	59,932	61,849
1987.....	92,155	92,155	30,752	30,752	61,403	61,403
1988.....	97,015	93,373	30,343	29,204	66,672	64,169
1989.....	102,055	94,060	28,554	26,317	73,501	67,743
1990.....	109,727	96,846	28,125	24,823	81,602	72,023
1991.....	116,952	99,449	26,372	22,425	90,580	77,024
1992.....	119,110	98,519	24,722	20,448	94,388	78,071
1993.....	118,334	95,817	22,813	18,472	95,521	77,345
1994 (NSF estimate).....	119,700	94,925	22,300	17,684	97,400	77,240
1995 (NSF estimate).....	121,400	93,601	22,100	17,039	99,300	76,561

1/ Company funds include funds for industrial R&D work performed within company facilities from all sources except the Federal Government. The funds may be the companies' own or from outside organizations such as research institutions, universities and colleges, nonprofit organizations, other companies, and state governments. Company-financed R&D not performed within the company is excluded.

NOTES: 1987 gross domestic product implicit price deflators were used to convert current dollars to constant dollars.

Further, as a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-2. Summary data for R&D-performing companies in selected manufacturing and detailed nonmanufacturing industries: 1992-93

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Industry 1/	SIC code	Research and development funds						Domestic net sales		R&D scientists & engineers		Domestic employment	
		Total		Federal		Company				January 2/		March	
		1992	1993	1992	1993	1992	1993	1992	1993	1993	1994	1992	1993
		[Dollars in millions]								[In thousands]			
Total.....		\$119,110	\$118,334	\$24,722	\$22,813	\$94,388	\$95,521	\$2,962,991	\$3,197,899	764.7	764.3	16,094	16,370
Food and kindred products.....	20	1,346	1,298	0	0	1,347	1,298	259,003	278,566	9.4	9.9	1,011	1,051
Tobacco products.....	21	40	40	0	0	(S)	40	4,938	5,093	(S)	0.2	15	16
Textile mill products.....	22	(D)	(D)	(D)	(D)	192	221	33,134	42,365	2.2	2.4	318	362
Apparel.....	23	(D)	(D)	(D)	(D)	69	67	8,767	10,443	0.9	1.0	84	111
Lumber and wood products, except furniture.....	24	(D)	(D)	(D)	(D)	45	44	6,692	10,826	0.3	1.2	59	83
Furniture and fixtures.....	25	(D)	(D)	(D)	(D)	189	204	18,030	20,507	1.3	3.7	211	228
Paper and allied products.....	26	1,232	(D)	(D)	(D)	1,182	1,252	113,037	112,061	10.6	10.9	557	572
Printing, publishing, and allied industries.....	27	301	(D)	(D)	(D)	241	309	26,668	32,172	2.3	9.9	278	299
Chemicals and allied products.....	28	15,382	(D)	(S)	(D)	15,213	16,747	271,488	285,104	86.5	94.9	1,118	1,191
Petroleum refining and extraction.....	13,29	2,277	2,117	9	14	2,268	2,103	236,594	235,180	11.0	10.2	407	377
Rubber products.....	30	(D)	(D)	(D)	(D)	1,256	1,092	52,892	51,115	13.0	9.0	393	377
Leather and leather products.....	31	30	(D)	(D)	(D)	30	23	3,442	2,782	0.3	0.3	32	23
Stone, clay, and glass products.....	32	591	(D)	(D)	(D)	479	535	28,813	34,611	5.1	5.2	227	251
Primary metals.....	33	522	669	(S)	23	514	646	85,806	87,280	4.6	5.1	433	447
Fabricated metal products.....	34	1,017	(D)	294	(D)	723	920	66,120	83,504	7.9	13.1	477	630
Machinery.....	35	14,938	8,267	1,035	88	13,903	8,182	190,025	181,499	97.4	69.1	1,320	1,137
Electrical equipment.....	36	13,360	12,647	3,844	1,402	9,516	11,285	235,628	217,523	89.2	92.3	1,362	1,224
Transportation.....	37	27,494	27,501	10,738	10,438	16,292	17,063	386,729	421,309	147.5	125.9	1,953	1,787
Professional and scientific instruments.....	38	9,542	10,288	2,226	2,767	7,321	7,521	100,832	106,949	(S)	(S)	748	764
Miscellaneous manufacturing industries.....	39	(D)	(D)	(D)	(D)	328	431	13,233	21,411	3.2	5.3	110	169
Communication services.....	48	5,309	5,491	(D)	(D)	(D)	(D)	177,763	182,254	32.6	29.5	957	917
Electric, gas, and sanitary services.....	49	292	339	10	46	282	292	164,438	190,214	1.6	1.6	543	568
Computer programming, data processing, other computer-related engineering, architectural, and surveying services.....	737,871	6,529	10,092	2,796	2,372	3,733	7,719	48,101	50,341	55.7	72.9	361	433
Hospitals and medical and dental laboratories.....	806-07	343	132	78	46	265	86	14,709	(S)	2.5	0.9	190	(S)
Research, development, and testing services.....	873	(T)	(T)	1,157	(S)	(T)	(T)	12,683	2,959	51.1	13.6	156	(S)
Other nonmanufacturing industries.....	07-10,12-17, 40-42,44-47, 50-59,60-65, 67,701,73 (except 737),75-78, 78-79,80-81 (except 806 and 807),83-84,87 (except 871 and 873),89	7,244	13,183	292	1,377	6,958	11,808	403,427	521,280	53.1	72.3	2,774	3,172

1/ Industries, industry groups, and product fields shown separately are classified using the 1987 Standard Industrial Classification (SIC) codes.

2/ Data recorded in January represent employment figures for the previous year.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld due to imputation of more than 50 percent.

(T) = Data not separately available, but are included in the total.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-3. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1983-93

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Industry and size of company		SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
[Dollars in millions]													
Total.....			\$65,268	\$74,800	\$84,239	\$87,823	\$92,155	\$97,015	\$102,055	\$109,727	\$116,952	\$119,110	\$118,334
Distribution by industry:													
13	Food, kindred, and tobacco products 1/.....	20,21	(D)	(D)	(D)	(D)	1,206	(D)	(D)	(D)	1,277	1,386	1,338
	Textiles and apparel.....	22,23	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
	Lumber, wood products, and furniture.....	24,25	152	143	147	144	137	(D)	192	216	(D)	(D)	(D)
	Paper and allied products.....	26	(D)	(D)	(D)	(D)	(D)	(D)	879	1,059	(D)	(D)	(D)
	Chemicals and allied products.....	28	7,185	7,927	8,540	8,843	9,635	11,067	12,069	13,291	14,648	15,381	(D)
	Industrial chemicals.....	281-82,286	3,214	3,240	3,498	3,552	3,716	4,172	4,451	5,010	5,390	5,165	(D)
	Drugs and medicines.....	283	(D)	(D)	(D)	3,658	(D)	4,906	(D)	(D)	(D)	7,944	9,147
	Other chemicals.....	284-85,287-89	(D)	(D)	(D)	1,633	(D)	1,989	(D)	(D)	(D)	2,272	(D)
	Petroleum refining and extraction.....	13,29	(D)	(D)	(D)	(D)	1,897	1,997	2,180	2,306	2,498	2,277	2,117
	Rubber products.....	30	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
	Stone, clay, and glass products.....	32	(D)	(D)	(D)	950	995	(D)	(D)	(D)	(D)	(D)	(D)
	Primary metals.....	33	1,085	(D)	(D)	(D)	730	637	686	739	714	522	669
	Ferrous metals and products.....	331-32,3398-99	(D)	(D)	(D)	(D)	(D)	253	(D)	(D)	(D)	(D)	289
	Nonferrous metals and products.....	333-36	(D)	336	416	458	(D)	384	(D)	(D)	(D)	(D)	380
	Fabricated metal products.....	34	701	842	829	895	783	881	904	939	974	1,017	(D)
	Machinery.....	35	9,027	10,504	12,216	(D)	(D)	(D)	(D)	14,446	14,775	14,938	8,270
	Office, computing, and accounting machines.....	357	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	4,811
	Other machinery, except electrical.....	351-56,358-59	(D)	(D)	(D)	2,396	2,428	2,682	2,729	(D)	(D)	(D)	3,459
	Electrical equipment.....	36	12,681	13,778	14,432	14,980	15,848	14,128	13,318	13,400	13,415	13,360	12,686
	Radio and TV receiving equipment.....	365	(D)	(D)	(D)	133	139	149	96	114	(D)	(D)	(D)
	Communication equipment.....	366	7,298	8,685	9,397	9,669	10,184	8,427	7,071	5,928	4,787	(D)	(D)
	Electronic components.....	367	2,169	2,831	3,385	(D)	4,286	4,133	4,025	3,914	(D)	3,567	5,316
	Other electrical equipment.....	361-64,369	(D)	(D)	(D)	(D)	1,239	1,419	2,126	3,444	(D)	(D)	(D)
	Transportation equipment.....	37	(D)	(D)	(D)	31,275	34,246	34,775	33,859	31,361	27,428	27,494	27,501
	Motor vehicles and motor vehicles equipment.....	371	5,318	6,057	6,984	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
	Other transportation equipment.....	373-75,379	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
	Aircraft and missiles.....	372,376	15,406	18,858	22,231	21,050	24,458	24,168	22,331	20,635	16,629	17,158	15,615

See explanatory information and SOURCE at end of table.

Table A-3. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1983-93

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Industry and size of company	SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
[Dollars in millions]												
Distribution by industry:												
Professional and scientific instruments.....	38	\$4,266	\$4,602	\$5,013	\$5,103	\$5,222	\$5,530	\$5,992	\$7,055	\$8,705	\$9,542	\$10,288
Scientific and mechanical measuring instruments.....	381-82	(D)	(D)	(D)	(D)	(D)	1,959	2,366	3,346	(D)	5,156	5,901
Optical, surgical, photographic, and other instruments.....	384-87	(D)	(D)	(D)	(D)	(D)	3,571	3,626	3,709	(D)	4,386	4,387
Other manufacturing industries 1/.....	27,31,39	(D)	(D)	(D)	382	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Nonmanufacturing industries 2/.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	3,337	4,905	6,714	7,446	7,844	10,513	14,031	20,793	28,446	28,933	31,320
Distribution by size of company: [Number of employees]												
Total.....		\$65,268	\$74,800	\$84,239	\$87,823	\$92,155	\$97,015	\$102,055	\$109,727	\$116,952	\$119,110	\$118,334
Fewer than 500.....		4,422	4,402	5,866	7,071	7,163	(S)	7,809	(S)	13,172	13,557	15,481
500 to 999 3/.....		N/A	1,439	1,648	1,902	1,725	1,669	1,825	2,154	8,000	7,958	3,198
1,000 to 4,999.....		4,178	5,520	6,240	7,472	7,262	7,622	7,881	8,411	10,453	11,886	13,277
5,000 to 9,999.....		2,798	3,251	4,022	4,251	4,501	5,245	5,756	6,746	8,049	8,258	9,023
10,000 to 24,999.....		9,499	11,351	11,109	10,493	12,043	11,506	10,450	12,486	15,770	15,744	15,105
25,000 or more.....		44,371	48,837	55,354	56,991	59,461	63,694	68,335	71,030	61,508	61,707	62,250

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

2/ Nonmanufacturing industries for 1990 and prior years included the following SICs only:

10-11, 14-17, 40-42, 44-51, 53-54, 66, 60, 62-63, 72-73, 78, 806-07, and 87.

3/ For 1983, data were not broken down into this level of detail. Data are included in "Fewer than 500," above.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

N/A = Not available

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

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Table A-4. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1993

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Industry	SIC code	Total	Size of company					
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
[Dollars in millions]								
Total.....		\$118,334	\$15,481	\$3,198	\$13,277	\$9,023	\$15,105	\$62,250
Food, kindred, and tobacco products.....	20,21	1,338	61	49	143	238	113	734
Textiles and apparel.....	22,23	(D)	(D)	(D)	128	8	67	(D)
Lumber, wood products, and furniture.....	24,25	(D)	(D)	11	79	43	(D)	(D)
Paper and allied products.....	26	(D)	125	(D)	76	42	(D)	(D)
Chemicals and allied products.....	28	(D)	1,203	(D)	2,723	(D)	(D)	(D)
Industrial chemicals.....	281-82,286	(D)	59	(D)	(D)	(D)	(D)	(D)
Drugs and medicines.....	283	9,147	(D)	108	(D)	660	(D)	2,772
Other chemicals.....	284-85,287-89	(D)	(D)	(D)	357	226	(D)	(D)
Petroleum refining and extraction.....	13,29	2,117	(D)	1	(D)	51	525	1,308
Rubber products.....	30	(D)	(D)	156	193	230	(D)	(D)
Stone, clay, and glass products.....	32	(D)	61	(D)	(D)	52	(D)	(D)
Primary metals.....	33	669	159	(D)	(D)	(D)	109	(D)
Ferrous metals and products.....	331-32,3398-99	289	73	(D)	58	(D)	(D)	(D)
Nonferrous metals and products.....	333-36	380	86	(D)	(D)	36	(D)	(D)
Fabricated metal products.....	34	(D)	236	(D)	(D)	(D)	(D)	(D)
Machinery.....	35	8,270	1,367	(D)	(D)	(D)	1,073	(D)
Office, computing, and accounting machines.....	357	4,811	630	(D)	(D)	(D)	(D)	(D)
Other machinery, except electrical.....	351-56,358-59	3,459	737	263	(D)	(D)	(D)	(D)
Electrical equipment.....	36	12,686	1,476	(D)	1,983	(D)	1,969	6,191
Radio and TV receiving equipment.....	365	(D)	(D)	(D)	(D)	0	0	0
Communication equipment.....	366	(D)	440	99	(D)	0	(D)	(D)
Electronic components.....	367	5,316	698	(D)	825	(D)	(D)	(D)
Other electrical equipment.....	361-64,369	(D)	(D)	(D)	(D)	(D)	276	(D)
Transportation equipment.....	37	27,501	(D)	(D)	(D)	407	(D)	(D)
Motor vehicles and motor vehicles equipment.....	371	(D)	10	(D)	(D)	(D)	(D)	(D)
Other transportation equipment.....	373-75,379	(D)	(D)	(D)	(D)	(D)	(D)	0
Aircraft and missiles.....	372,376	15,615	10	(D)	149	(D)	(D)	13,634

See explanatory information and SOURCE at end of table.

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Table A-4. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1993

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Industry	SIC code	Total	Size of company					
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
			[Dollars in millions]					
Professional and scientific instruments.....	38	\$10,288	(D)	\$448	\$1,198	(D)	\$495	\$6,402
Scientific and mechanical measuring instruments.....	381-82	5,901	(D)	(D)	(D)	(D)	(D)	(D)
Optical, surgical, photographic, and other instruments.....	384-87	4,387	617	(D)	(D)	(D)	(D)	(D)
Other manufacturing industries.....	27,31,39	(D)	(D)	(D)	157	185	(D)	(D)
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	31,320	9,070	889	3,468	(D)	(D)	13,503

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-5. Total (company, Federal, and other) funds for industrial R&D performance, by industry, size of company, and size of R&D program: 1993

Page 1 of 1

Industry and size of company	SIC code	Total	Size of R&D program				
			Less than \$200,000	\$200,000 to \$999,999	\$1 million to \$9,999 million	\$10 million to \$99,999 million	\$100 million or more
[Dollars in millions]							
Total.....		\$118,334	\$1,260	\$2,567	\$11,632	\$20,818	\$82,057
Distribution by industry:							
Food, kindred, and tobacco products.....	20,21	1,338	(D)	58	203	619	(D)
Textiles and apparel.....	22,23	(D)	(D)	29	125	124	0
Lumber, wood products, and furniture.....	24,25	(D)	(D)	32	55	139	0
Paper and allied products.....	26	(D)	(D)	40	202	334	(D)
Chemicals and allied products.....	28	(D)	(D)	131	574	3,369	13,988
Industrial chemicals.....	281-82,286	(D)	(D)	8	183	1,138	5,298
Drugs and medicines.....	283	9,147	19	10	188	1,543	7,387
Other chemicals.....	284-85,287-89	(D)	(D)	113	203	688	1,303
Petroleum refining and extraction.....	13,29	2,117	3	21	51	479	1,563
Rubber products.....	30	(D)	(D)	85	259	356	(D)
Stone, clay, and glass products.....	32	(D)	(D)	28	71	398	(D)
Primary metals.....	33	669	(D)	135	153	238	(D)
Ferrous metals and products.....	331-32,3398-99	289	13	65	80	131	0
Nonferrous metals and products.....	333-36	380	(D)	70	73	107	(D)
Fabricated metal products.....	34	(D)	46	172	275	447	(D)
Machinery.....	35	8,270	116	380	1,271	2,236	4,267
Office, computing, and accounting machines.....	357	4,811	12	72	452	1,225	3,050
Other machinery, except electrical.....	351-56,358-59	3,459	104	308	819	1,011	1,217
Electrical equipment.....	36	12,686	67	239	1,247	2,831	8,302
Radio and TV receiving equipment.....	365	(D)	0	22	36	(D)	0
Communication equipment.....	366	(D)	(D)	58	365	836	2,359
Electronic components.....	367	5,316	14	64	531	1,178	3,529
Other electrical equipment.....	361-64,369	(D)	(D)	95	315	(D)	2,414
Transportation equipment.....	37	27,501	12	48	264	840	26,337
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)	9	102	428	11,156
Other transportation equipment.....	373-75,379	(D)	(D)	30	35	114	0
Aircraft and missiles.....	372,376	15,615	0	9	127	298	15,181
Professional and scientific instruments.....	38	10,288	75	165	1,097	1,944	7,007
Scientific and mechanical measuring instruments..	381-82	5,901	4	117	488	1,072	4,220
Optical, surgical, photographic, and other instruments.....	384-87	4,387	71	48	609	872	2,787
Other manufacturing industries.....	27,31,39	(D)	(D)	70	220	385	0
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	31,320	620	924	5,565	6,079	18,132
Distribution by size of company: [Number of employees]							
Total.....		\$118,334	\$1,260	\$2,567	\$11,632	\$20,818	\$82,057
Fewer than 500.....		15,481	(D)	2,273	7,820	3,296	(D)
500 to 999.....		3,198	13	148	1,122	1,915	0
1,000 to 4,999.....		13,277	(D)	(D)	2,128	8,049	(D)
5,000 to 9,999.....		9,023	1	16	321	2,930	5,755
10,000 to 24,999.....		15,105	0	9	157	2,867	12,072
25,000 or more.....		62,250	(D)	(D)	84	1,761	60,404

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

**Table A-6. Number of R&D-performing companies, by industry,
size of company, and size of R&D program: 1993**

Page 1 of 1

Industry and size of company	SIC code	Total	Size of R&D program				
			Less than \$200,000	\$200,000 to \$999,999	\$1 million to \$9,999 million	\$10 million to \$99,999 million	\$100 million or more
Total.....		40,953	29,767	6,486	3,812	749	139
Food, kindred, and tobacco products.....	20,21	1,634	1,430	120	58	(D)	(D)
Textiles and apparel.....	22,23	504	383	67	47	7	0
Lumber, wood products, and furniture.....	24,25	710	610	75	20	6	0
Paper and allied products.....	26	321	155	95	57	(D)	(D)
Chemicals and allied products.....	28	1,628	1,025	311	156	103	34
Industrial chemicals.....	281-82,286	140	41	16	46	25	11
Drugs and medicines.....	283	258	124	17	47	52	19
Other chemicals.....	284-85,287-89	1,231	861	277	63	26	4
Petroleum refining and extraction.....	13,29	118	50	37	12	13	6
Rubber products.....	30	732	464	146	106	(D)	(D)
Stone, clay, and glass products.....	32	559	459	61	28	(D)	(D)
Primary metals.....	33	655	335	260	48	(D)	(D)
Ferrous metals and products.....	331-32,3398-99	422	258	133	23	7	0
Nonferrous metals and products.....	333-36	234	77	126	25	(D)	(D)
Fabricated metal products.....	34	1,422	872	429	105	(D)	(D)
Machinery.....	35	4,223	2,777	920	424	83	19
Office, computing, and accounting machines.....	357	534	188	145	146	42	13
Other machinery, except electrical.....	351-56,358-59	3,689	2,589	775	278	41	6
Electrical equipment.....	36	2,171	1,130	504	429	95	13
Radio and TV receiving equipment.....	365	65	13	40	(D)	(D)	0
Communication equipment.....	366	483	201	122	(D)	(D)	3
Electronic components.....	367	652	306	123	174	42	7
Other electrical equipment.....	361-64,369	969	609	218	112	28	3
Transportation equipment.....	37	502	265	116	72	31	18
Motor vehicles and motor vehicles equipment.....	371	193	130	18	27	14	4
Other transportation equipment.....	373-75,379	215	130	69	12	4	0
Aircraft and missiles.....	372,376	94	5	29	33	13	14
Professional and scientific instruments.....	38	1,594	793	407	315	67	12
Scientific and mechanical measuring instruments..	381-82	551	45	324	141	34	7
Optical, surgical, photographic, and other instruments.....	384-87	1,042	747	83	174	33	5
Other manufacturing industries.....	27,31,39	1,259	966	214	66	12	0
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	22,922	18,053	2,727	1,869	247	27
Distribution by size of company: [Number of employees]							
Total.....		40,953	29,767	6,486	3,812	749	139
Fewer than 500.....		38,330	29,443	5,934	2,772	(D)	(D)
500 to 999.....		896	172	280	358	86	0
1,000 to 4,999.....		1,185	128	228	547	263	18
5,000 to 9,999.....		238	17	27	73	97	24
10,000 to 24,999.....		179	(D)	(D)	42	(D)	(D)
25,000 or more.....		125	(D)	(D)	20	44	58

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-7. Company and other (except Federal) funds for industrial R&D performance, by industry and size of company: 1983-93

Page 1 of 2

Industry and size of company		SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
			[Dollars in millions]										
Total.....			\$44,588	\$51,404	\$57,043	\$59,932	\$61,403	\$66,672	\$73,501	\$81,602	\$90,580	\$94,388	\$95,521
Distribution by industry:													
Food, kindred, and tobacco products 1/.....		20,21	824	1,081	1,136	1,280	1,204	1,173	1,244	1,248	1,277	1,386	1,338
Textiles and apparel.....		22,23	150	182	218	246	243	215	(S)	260	236	261	288
Lumber, wood products, and furniture.....		24,25	152	143	147	144	137	165	192	216	200	234	248
Paper and allied products.....		26	552	594	576	538	604	752	879	1,059	1,174	1,182	1,252
Chemicals and allied products.....		28	6,792	7,736	8,310	8,664	9,445	10,828	11,943	13,168	14,439	15,091	16,747
Industrial chemicals.....		281-82,286	2,828	3,057	3,281	3,374	3,531	3,939	4,340	4,902	5,225	4,911	5,274
Drugs and medicines.....		283	2,896	3,310	3,481	3,657	4,095	4,900	5,512	5,917	6,947	7,934	9,133
Other chemicals.....		284-85,287-89	1,068	1,369	1,548	1,633	1,819	1,989	2,091	2,349	2,267	2,246	2,340
Petroleum refining and extraction.....		13,29	2,074	2,245	2,194	1,971	1,883	1,975	2,162	2,289	2,487	2,268	2,103
Rubber products.....		30	638	671	659	655	596	718	867	1,056	(D)	1,256	1,092
Stone, clay, and glass products.....		32	586	705	825	941	985	697	615	538	455	479	535
Primary metals.....		33	701	683	730	786	711	620	666	717	706	514	646
Ferrous metals and products.....		331-32,3398-99	396	357	323	336	249	252	244	231	225	221	272
Nonferrous metals and products.....		333-36	305	326	407	450	462	368	422	486	481	293	374
Fabricated metal products.....		34	634	773	780	800	633	718	726	736	748	723	920
Machinery.....		35	7,911	9,312	10,721	10,701	10,577	11,929	13,342	13,575	13,720	13,903	8,182
Office, computing, and accounting machines.....		357	5,634	7,011	8,418	8,380	8,193	9,347	10,725	10,988	10,419	10,614	4,778
Other machinery, except electrical.....		351-56,358-59	2,277	2,301	2,303	2,321	2,384	2,582	2,618	2,587	3,301	3,289	3,404
Electrical equipment.....		36	8,158	9,037	9,271	9,767	10,449	9,975	9,575	9,267	8,865	9,516	11,285
Radio and TV receiving equipment.....		365	324	362	350	133	139	149	96	114	(D)	93	84
Communication equipment.....		366	4,500	5,147	5,174	5,117	5,455	4,798	4,159	3,584	(S)	3,381	3,129
Electronic components.....		367	1,810	2,354	2,826	3,357	3,630	3,684	3,655	3,496	3,177	3,320	5,089
Other electrical equipment.....		361-64,369	1,524	1,174	921	1,160	1,225	1,345	1,664	2,073	(D)	2,722	2,983
Transportation equipment.....		37	8,991	10,406	12,092	13,567	13,462	13,910	14,596	14,264	14,858	16,292	17,063
Motor vehicles and motor vehicles equipment.....		371	4,754	5,384	6,164	7,171	7,167	7,783	8,756	8,594	9,063	9,132	10,652
Other transportation equipment.....		373-75,379	227	258	279	330	356	361	337	283	262	289	165
Aircraft and missiles.....		372,376	4,010	4,764	5,649	6,066	5,939	5,766	5,503	5,387	5,533	6,871	6,246

See explanatory information and SOURCE at end of table.

Table A-7. Company and other (except Federal) funds for industrial R&D performance, by industry and size of company: 1983-93

Page 2 of 2

Industry and size of company	SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
[Dollars in millions]												
Distribution by industry:												
Professional and scientific instruments.....	38	\$3,816	\$4,211	\$4,622	\$4,752	\$4,950	\$5,339	\$5,729	\$6,318	\$6,840	7,321	7,521
Scientific and mechanical measuring instruments..	381-82	1,605	1,671	1,596	1,521	1,598	1,863	2,205	2,696	3,017	3,013	3,231
Optical, surgical, photographic, and other instruments.....	384-87	2,211	2,540	3,026	3,231	3,352	3,476	3,524	3,621	3,823	4,308	4,290
Other manufacturing industries 1/.....	27,31,39	525	373	361	380	380	401	438	541	(D)	599	763
Nonmanufacturing industries 2/.....	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	2,084	3,252	4,401	4,740	5,144	7,257	10,302	16,351	22,941	23,363	25,538
Distribution by size of company:												
[Number of employees]												
Total.....		\$44,588	\$51,404	\$57,043	\$59,932	\$61,403	\$66,672	\$73,501	\$81,602	\$90,580	\$94,388	\$95,521
Fewer than 500.....		3,781	3,781	5,127	6,203	6,200	(S)	(S)	(S)	11,285	11,532	13,861
500 to 999 3/.....		N/A	1,341	1,531	1,765	1,610	1,748	1,934	2,144	7,819	7,807	3,005
1,000 to 4,999.....		3,438	4,618	5,249	6,243	6,281	6,820	7,546	8,363	9,403	10,885	12,164
5,000 to 9,999.....		2,080	2,784	3,350	3,455	3,753	4,075	4,509	4,997	7,233	7,495	8,280
10,000 to 24,999.....		7,228	8,546	8,366	8,489	9,681	10,512	11,631	12,890	12,397	12,328	12,555
25,000 or more.....		28,061	30,354	33,420	33,777	33,878	36,785	40,703	45,106	42,443	44,361	45,656

1/ Until 1984, tobacco products (SIC 21) was included with "other manufacturing industries."

2/ Nonmanufacturing industries for 1990 and prior years included the following SICs only:

10-11, 14-17, 40-42, 44-51, 53-54, 66, 60, 62-63, 72-73, 78, 806-07, and 87.

3/ For 1983, data were not broken down into this level of detail. Data are included in "Fewer than 500," above.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

N/A = Not available

NOTES: Company funds include funds for industrial R&D work performed within company facilities from all sources except the Federal Government. The funds may be the companies' own or from outside organizations such as research institutions, universities and colleges, nonprofit organizations, other companies, and state governments. Company-financed R&D not performed within the company is excluded.

Further, as a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-8. Company and other (except Federal) funds for industrial R&D performance, by industry and size of company: 1993

Page 1 of 1

Industry	SIC code	Total	Size of company					
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
			[Dollars in millions]					
Total.....		\$95,521	\$13,861	\$3,005	\$12,164	\$8,280	\$12,555	\$45,656
Food, kindred, and tobacco products.....	20.21	1,338	61	49	143	238	113	734
Textiles and apparel.....	22.23	288	44	(D)	128	8	67	(D)
Lumber, wood products, and furniture.....	24.25	248	50	11	79	43	(D)	(D)
Paper and allied products.....	26	1,252	125	(D)	76	42	(D)	674
Chemicals and allied products.....	28	16,747	1,191	(D)	2,717	1,527	5,605	(D)
Industrial chemicals.....	281-82.286	5,274	59	(D)	637	641	1,769	(D)
Drugs and medicines.....	283	9,133	880	108	1,724	660	2,989	2,772
Other chemicals.....	284-85.287-89	2,340	252	(D)	357	226	846	(D)
Petroleum refining and extraction.....	13.29	2,103	28	1	202	51	521	1,299
Rubber products.....	30	1,092	190	156	193	230	(D)	(D)
Stone, clay, and glass products.....	32	535	54	(D)	73	52	259	(D)
Primary metals.....	33	646	144	(D)	118	101	105	(D)
Ferrous metals and products.....	331-32.3398-99	272	58	(D)	58	65	47	(D)
Nonferrous metals and products.....	333-36	374	86	(D)	61	36	58	(D)
Fabricated metal products.....	34	920	234	45	217	(D)	309	(D)
Machinery.....	35	8,182	1,362	553	2,019	2,195	(D)	(D)
Office, computing, and accounting machines.....	357	4,778	629	290	1,206	1,885	(D)	(D)
Other machinery, except electrical.....	351-56.358-59	3,404	733	263	814	310	(D)	(D)
Electrical equipment.....	36	11,285	1,418	420	1,896	612	1,989	4,970
Radio and TV receiving equipment.....	365	84	31	(D)	49	0	0	0
Communication equipment.....	366	3,129	420	99	734	0	(D)	(D)
Electronic components.....	367	5,089	685	198	799	(D)	(D)	(D)
Other electrical equipment.....	361-64.369	2,983	289	(D)	313	(D)	276	1,985
Transportation equipment.....	37	17,063	58	156	293	336	657	15,563
Motor vehicles and motor vehicles equipment.....	371	10,652	10	(D)	(D)	157	(D)	10,004
Other transportation equipment.....	373-75.379	165	39	(D)	(D)	87	(D)	0
Aircraft and missiles.....	372.376	6,246	10	115	113	92	358	5,559
Professional and scientific instruments.....	38	7,521	1,094	378	1,083	573	319	4,074
Scientific and mechanical measuring instruments.....	381-82	3,231	495	185	496	(D)	(D)	1,650
Optical, surgical, photographic, and other instruments.....	384-87	4,290	599	193	587	(D)	(D)	2,424
Other manufacturing industries.....	27.31.39	763	183	(D)	157	185	174	(D)
Nonmanufacturing industries.....	07-10.12-17, 40-42.44-49, 50-59.60-65.67, 701.73.75-76, 78-79.80-81, 83-8.87.89	25,538	7,624	836	2,769	1,997	1,033	11,277

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

**Table A-9. Company-financed R&D contracted to outside organizations,
by industry and size of company: 1991 and 1993**

Page 1 of 1

Industry	SIC code	1991	1993
[Dollars in millions]			
Total.....		\$3,319	\$4,010
Distribution by industry:			
Food, kindred, and tobacco products.....	20,21	44	44
Textiles and apparel.....	22,23	(D)	3
Lumber, wood products, and furniture.....	24,25	(D)	6
Paper and allied products.....	26	12	(D)
Chemicals and allied products.....	28	1,087	1,416
Industrial chemicals.....	281-82,286	95	(S)
Drugs and medicines.....	283	771	1,059
Other chemicals.....	284-85,287-89	221	202
Petroleum refining and extraction.....	13,29	35	74
Rubber products.....	30	18	65
Stone, clay, and glass products.....	32	(D)	4
Primary metals.....	33	24	19
Ferrous metals and products.....	331-32,3398-99	4	14
Nonferrous metals and products.....	333-36	20	4
Fabricated metal products.....	34	3	21
Machinery.....	35	256	146
Office, computing, and accounting machines.....	357	229	71
Other machinery, except electrical.....	351-56,358-59	27	75
Electrical equipment.....	36	114	145
Radio and TV receiving equipment.....	365	0	1
Communication equipment.....	366	63	20
Electronic components.....	367	38	25
Other electrical equipment.....	361-64,369	13	99
Transportation equipment.....	37	687	616
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)
Other transportation equipment.....	373-75,379	(S)	2
Aircraft and missiles.....	372,376	(D)	(D)
Professional and scientific instruments.....	38	(D)	197
Scientific and mechanical measuring instruments.....	381-82	4	40
Optical, surgical, photographic, and other instruments.....	383-87	(D)	157
Other manufacturing industries.....	27,31,39	2	32
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	742	1,163
Distribution by size of company: [Number of employees]			
Total.....		3,319	\$4,010
Fewer than 500.....		(S)	674
500 to 999.....		35	86
1,000 to 4,999.....		275	433
5,000 to 9,999.....		218	364
10,000 to 24,999.....		881	754
25,000 or more.....		1,762	1,699

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: As a result of a new sample design and corrections to reported data, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-10. Number of companies contracting R&D performance to outside organizations and total number of R&D-performing companies, by industry and size of company: 1993

Page 1 of 1

Industry	SIC code	Size of company											
		Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees		5,000 to 9,999 employees		10,000 to 24,999 employees		25,000 or more employees	
		Total	Outside	Total	Outside	Total	Outside	Total	Outside	Total	Outside	Total	Outside
Total.....		38,330	5,012	896	152	1,185	189	238	52	179	35	125	32
Food, kindred, and tobacco products.....	20,21	1,463	60	57	11	71	11	22	(D)	10	(D)	11	(D)
Textiles and apparel.....	22,23	397	38	32	(D)	55	6	(D)	(D)	8	0	(D)	0
Lumber, wood products, and furniture.....	24,25	622	(D)	41	10	34	(D)	9	0	(D)	0	(D)	0
Paper and allied products.....	26	234	20	34	0	31	(D)	7	(D)	9	0	6	(D)
Chemicals and allied products.....	28	1,443	339	56	9	79	15	20	(D)	21	7	9	(D)
Industrial chemicals.....	281-82,286	77	18	16	0	27	(D)	8	0	(D)	(D)	(D)	(D)
Drugs and medicines.....	283	206	165	11	4	26	5	4	(D)	7	5	4	(D)
Other chemicals.....	284-85,287-89	1,160	156	29	5	26	(D)	8	(D)	(D)	(D)	(D)	(D)
Petroleum refining and extraction.....	13,29	84	(D)	4	0	15	(D)	3	0	6	(D)	6	(D)
Rubber products.....	30	612	84	58	9	51	5	7	0	(D)	(D)	(D)	(D)
Stone, clay, and glass products.....	32	507	15	17	3	23	6	(D)	(D)	6	0	(D)	(D)
Primary metals.....	33	561	87	22	(D)	50	10	14	4	(D)	(D)	(D)	(D)
Ferrous metals and products.....	331-32,3398-99	359	78	13	(D)	34	(D)	11	4	(D)	(D)	(D)	(D)
Nonferrous metals and products.....	333-36	202	9	9	(D)	16	(D)	3	0	(D)	(D)	(D)	0
Fabricated metal products.....	34	1,260	104	66	9	77	14	(D)	0	14	(D)	(D)	0
Machinery.....	35	3,921	410	127	13	135	15	25	(D)	10	0	(D)	(D)
Office, computing, and accounting machines.....	357	472	85	20	0	30	(D)	(D)	(D)	(D)	0	(D)	(D)
Other machinery, except electrical.....	351-56,358-59	3,449	325	107	13	105	(D)	(D)	(D)	(D)	0	(D)	(D)
Electrical equipment.....	36	1,941	335	90	8	111	13	8	(D)	9	0	10	(D)
Radio and TV receiving equipment.....	365	59	(D)	(D)	(D)	5	0	0	0	0	0	0	0
Communication equipment.....	366	442	(D)	(D)	(D)	23	(D)	0	0	(D)	0	(D)	0
Electronic components.....	367	572	85	32	(D)	38	(D)	(D)	(D)	(D)	0	(D)	0
Other electrical equipment.....	361-64,369	868	155	42	5	45	9	(D)	0	6	0	6	(D)
Transportation equipment.....	37	360	51	46	25	56	7	18	(D)	9	3	13	(D)
Motor vehicles and motor vehicles equipment.....	371	134	41	10	0	34	(D)	8	(D)	(D)	(D)	3	(D)
Other transportation equipment.....	373-75,379	195	(D)	7	(D)	8	(D)	4	(D)	(D)	0	0	0
Aircraft and missiles.....	372,376	31	(D)	29	(D)	14	(D)	6	0	4	(D)	10	(D)
Professional and scientific instruments.....	38	1,438	787	72	10	64	9	6	(D)	6	0	8	(D)
Scientific and mechanical measuring instruments.....	381-82	474	99	40	5	26	(D)	(D)	(D)	(D)	0	5	(D)
Optical, surgical, photographic, and other instruments.....	383-87	964	688	32	5	38	(D)	(D)	(D)	(D)	0	3	0
Other manufacturing industries.....	27,31,39	1,146	126	44	16	47	7	12	(D)	(D)	0	(D)	0
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	22,341	2,507	130	22	284	60	69	24	54	17	44	11

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

**Table A-11. Company-financed R&D performed outside the United States by U.S. domestic companies
and their foreign subsidiaries, by selected industry: 1983-93**

Page 1 of 1

Industry	SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
[Dollars in millions]												
Total.....		\$3,269	\$3,633	\$3,650	\$4,624	\$5,226	\$6,208	\$6,706	\$7,952	\$9,147	\$10,083	\$9,781
Food, kindred, and tobacco products 1/.....	20,21	63	70	75	69	37	27	42	41	66	88	108
Chemicals and allied products.....	28	729	786	843	1,071	1,243	1,548	1,532	2,007	2,401	2,676	2,814
Industrial and other chemicals.....	281-82,284-89	368	385	444	579	625	855	609	720	1,009	1,045	1,313
Drugs and medicines.....	283	361	401	399	492	618	693	923	1,287	1,392	1,631	1,501
Petroleum refining and extraction.....	13,29	103	101	47	40	47	59	47	76	107	119	106
Stone, clay, and glass products.....	32	19	60	(D)	(D)	(D)	(D)	(D)	59	38	41	38
Primary metals.....	33	10	9	(D)	(D)	18	23	24	26	20	18	12
Fabricated metal products.....	34	23	21	21	26	40	(D)	(D)	95	86	109	117
Machinery.....	35	577	740	689	951	1,233	1,326	1,432	1,451	1,476	1,439	342
Electrical equipment.....	36	482	537	591	(S)	432	591	573	770	651	568	644
Radio and TV receiving equipment.....	365	(T)	(D)	(D)	(D)	0	(D)	(D)	(D)	2	(D)	(D)
Communication equipment.....	366		(D)	(D)	(D)	188	290	199	174	151	(D)	(D)
Electronic components.....	367	(T)	92	117	150	204	246	160	185	164	168	322
Other electrical equipment.....	361-64,369	38	30	24	25	39	(D)	(D)	(D)	334	217	114
Transportation equipment.....	37	880	907	1,025	(D)	(D)	1,750	1,916	2,055	2,402	(D)	(D)
Motor vehicles and other transportation equipment.....	371,373-75,379	(T)	(D)	(D)	(D)	(D)	1,477	1,501	1,901	2,166	(D)	(D)
Aircraft and missiles.....	372,376	(T)	(D)	(D)	182	237	273	415	154	236	493	290
Professional and scientific instruments.....	38	(T)	263	169	212	317	404	474	611	656	685	761
Other manufacturing industries 1/.....	22-27,30-31,39	92	131	125	141	138	178	269	344	467	524	(D)
Nonmanufacturing industries 2/.....	07-10, 12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	10	8	18	27	64	146	256	415	778	835	1,796

1/ Until 1984, tobacco products, SIC 21, was included with "other manufacturing industries."

2/ Nonmanufacturing industries for 1990 and prior years included the following SICs only:

10-11, 14-17, 40-42, 44-51, 53-54, 66, 60, 62-63, 72-73, 78, 806-07, and 87.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.
(T) = Data not separately available, but are included in total.

NOTES: Data are reported in current U.S. dollars.

Further, as a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

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Table A-12. Federal funds for industrial R&D performance, by industry and size of company: 1983-93

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Industry and size of company		SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
			[Dollars in millions]										
Total.....			\$20,680	\$23,396	\$27,196	\$27,891	\$30,752	\$30,343	\$28,554	\$28,125	\$26,372	\$24,722	\$22,813
Distribution by industry:													
Food, kindred, and tobacco products 1/.....		20,21	(D)	(D)	(D)	(D)	2	(D)	(D)	(D)	0	0	0
Textiles and apparel.....		22,23	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(S)	(S)	(D)
Lumber, wood products, and furniture.....		24,25	0	0	0	0	0	(D)	0	0	(D)	(D)	(D)
Paper and allied products.....		26	(D)	(D)	(D)	(D)	(D)	(D)	0	0	(D)	(D)	(D)
Chemicals and allied products.....		28	393	191	230	179	190	238	126	123	209	(S)	(D)
Industrial chemicals.....		281-82,286	386	183	217	178	185	232	111	109	165	(S)	(D)
Drugs and medicines.....		283	(D)	(D)	(D)	1	(D)	6	(D)	(D)	(D)	11	15
Other chemicals.....		284-85,287-89	(D)	(D)	(D)	0	(D)	0	(D)	(D)	(D)	(S)	(D)
Petroleum refining and extraction.....		13,29	(D)	(D)	(D)	(D)	14	22	(S)	(S)	11	9	14
Rubber products.....		30	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Stone, clay, and glass products.....		32	(D)	(D)	(D)	9	10	(D)	(D)	(D)	(D)	(D)	(D)
Primary metals.....		33	384	(D)	(D)	(D)	19	17	22	(D)	8	(S)	23
Ferrous metals and products.....		331-32,3398-99	(D)	(D)	(D)	(D)	(D)	1	(D)	(D)	1	(D)	17
Nonferrous metals and products.....		333-36	(D)	10	9	8	(D)	16	(D)	(D)	7	(D)	6
Fabricated metal products.....		34	67	69	49	95	150	163	178	203	226	294	(D)
Machinery.....		35	1,116	1,192	1,495	(D)	(D)	(D)	(D)	871	1,055	1,035	88
Office, computing, and accounting machines.....		357	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	33
Other machinery, except electrical.....		351-56,358-59	(D)	(D)	(D)	75	44	101	112	(D)	(D)	(D)	55
Electrical equipment.....		36	4,523	4,741	5,161	5,213	5,399	4,153	3,743	4,133	4,550	3,844	1,402
Radio and TV receiving equipment.....		365	(D)	(D)	(D)	0	0	0	0	0	0	(D)	(D)
Communication equipment.....		366	2,798	3,538	4,223	4,552	4,729	3,630	2,911	2,344	(D)	(D)	(D)
Electronic components.....		367	359	477	559	(D)	656	449	369	418	(D)	247	(S)
Other electrical equipment.....		361-64,369	(D)	(D)	(D)	(D)	14	74	463	1,371	(D)	(D)	(D)
Transportation equipment.....		37	(D)	(D)	(D)	17,708	20,784	20,865	19,262	17,097	12,570	11,202	10,438
Motor vehicles and motor vehicles equipment.....		371	564	673	820	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment.....		373-75,379	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles.....		372,376	11,396	14,094	16,582	14,984	18,519	18,402	16,828	15,248	11,096	(S)	9,369

See explanatory information and SOURCE at end of table.

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Table A-12. Federal funds for industrial R&D performance, by industry and size of company: 1983-93

Page 2 of 2

Industry and size of company	SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
[Dollars in millions]												
Professional and scientific instruments.....	38	450	391	391	351	272	191	263	737	1,865	2,221	2,767
Scientific and mechanical measuring instruments..	381-82	(D)	(D)	(D)	(D)	(D)	(S)	(S)	(S)	(D)	2,143	2,670
Optical, surgical, photographic, and other instruments.....	384-87	(D)	(D)	(D)	(D)	(D)	95	101	87	(D)	78	97
Other manufacturing industries 1/.....	27,31,39	(D)	(D)	(D)	2	(D)	(D)	(D)	(D)	(D)	61	(D)
Nonmanufacturing industries 2/.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	1,253	1,653	2,313	2,706	2,700	3,256	3,729	4,442	5,505	5,570	5,784
Distribution by size of company: [Number of employees]												
Total.....		\$20,680	\$23,396	\$27,196	\$27,891	\$30,752	\$30,343	\$28,554	\$28,125	\$26,372	\$24,722	\$22,813
Fewer than 500.....		641	621	739	868	963	816	901	895	1,887	2,025	1,620
500 to 999 3/.....		N/A	98	117	137	115	131	117	(S)	181	151	193
1,000 to 4,999.....		740	902	991	1,229	981	1,093	958	881	1,050	(S)	1,113
5,000 to 9,999.....		718	487	672	796	748	864	740	257	816	763	(S)
10,000 to 24,999.....		2,271	2,805	2,743	2,004	2,362	1,705	1,129	1,526	3,373	3,416	2,550
25,000 or more.....		16,310	18,483	21,934	23,213	25,583	25,734	24,709	24,436	19,065	17,346	16,594

1/ Until 1984, tobacco products (SIC 21) was included with "other manufacturing industries."

2/ Nonmanufacturing industries for 1990 and prior years included the following SICs only:

10-11, 14-17, 40-42, 44-51, 53-54, 66, 60, 62-63, 72-73, 78, 806-07, and 87.

3/ For 1983, data were not broken down into this level of detail. Data are included in "Fewer than 500," above.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

N/A = Not available

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-13. Federal funds for industrial R&D performance, by industry, and size of company: 1993

Page 1 of 1

Page 1 of 1

Industry	SIC code	Total	Size of company					
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
			[Dollars in millions]					
Total.....		\$22,813	\$1,620	\$193	\$1,113	(S)	\$2,550	\$16,594
Food, kindred, and tobacco products.....	20,21	0	0	0	0	0	0	0
Textiles and apparel.....	22,23	(D)	(D)	0	0	0	0	(D)
Lumber, wood products, and furniture.....	24,25	(D)	(D)	0	0	0	0	(D)
Paper and allied products.....	26	(D)	0	0	0	0	0	(D)
Chemicals and allied products.....	28	(D)	12	0	6	(D)	(D)	(D)
Industrial chemicals.....	281-82,286	(D)	0	0	(D)	(D)	(D)	(D)
Drugs and medicines.....	283	14	(D)	0	(D)	0	(D)	(D)
Other chemicals.....	284-85,287-89	(D)	(D)	0	0	0	(D)	0
Petroleum refining and extraction.....	13,29	14	(D)	0	(D)	0	4	9
Rubber products.....	30	(D)	(D)	0	0	0	0	0
Stone, clay, and glass products.....	32	(D)	7	0	(D)	0	(D)	(D)
Primary metals.....	33	23	15	0	(D)	(D)	(S)	(D)
Ferrous metals and products.....	331-32,3398-99	17	15	0	0	(D)	(D)	0
Nonferrous metals and products.....	333-36	6	0	0	(D)	0	(D)	(D)
Fabricated metal products.....	34	(D)	2	(D)	(D)	0	(D)	(D)
Machinery.....	35	88	5	(D)	(D)	(D)	(D)	32
Office, computing, and accounting machines.....	357	33	1	(D)	(D)	(D)	0	(D)
Other machinery, except electrical.....	351-56,358-59	55	4	0	(D)	(D)	29	(D)
Electrical equipment.....	36	1,401	58	(D)	87	(D)	0	1,221
Radio and TV receiving equipment.....	365	(D)	(D)	0	(D)	0	0	0
Communication equipment.....	366	(D)	20	0	(D)	0	0	(D)
Electronic components.....	367	(S)	13	(D)	26	(D)	0	(D)
Other electrical equipment.....	361-64,369	(D)	(D)	2	(D)	0	0	(D)
Transportation equipment.....	37	10,438	(D)	(D)	(D)	71	(D)	(D)
Motor vehicles and motor vehicles equipment.....	371	(D)	0	(D)	(D)	(D)	(D)	(D)
Other transportation equipment.....	373-75,379	(D)	(D)	0	0	(D)	0	0
Aircraft and missiles.....	372,376	9,369	0	(D)	36	(D)	(D)	8,075
Professional and scientific instruments.....	38	2,767	(D)	70	115	(D)	176	2,328
Scientific and mechanical measuring instruments..	381-82	2,670	(D)	(D)	(D)	(D)	176	(D)
Optical, surgical, photographic, and other instruments.....	384-87	97	(S)		(D)	0	0	(D)
Other manufacturing industries.....	27,31,39	(D)	(D)	0	0	0	(D)	0
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	5,782	1,446	53	699	(D)	(D)	2,226

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-14. Federal funds for industrial R&D performance, by agency and selected industry in selected years: 1974-93

Page 1 of 1

Industry	SIC code	1974	1975	1976	1977	1979	1981	1983	1985	1987	1989	1991	1993
[Dollars in millions]													
All agencies.....		\$8,220	\$8,605	\$9,561	\$10,485	\$12,518	\$16,382	\$20,680	\$27,196	\$30,752	\$26,554	\$26,372	\$22,813
Chemicals and allied products.....	28	214	236	266	295	346	421	393	230	190	126	209	(D)
Machinery.....	35	511	509	532	477	335	694	1,116	1,495	(D)	(D)	1,055	88
Electrical equipment.....	36	2,307	2,307	2,555	2,648	3,309	3,920	4,523	5,161	5,399	3,743	4,550	1,402
Motor vehicles and other transportation equipment.....	371,373-75,379	335	365	(T)	(T)	(T)	(T)	(T)	(T)	(D)	(D)	(D)	(D)
Aircraft and missiles.....	372,376	4,003	4,434	4,930	5,486	5,840	8,528	11,396	16,582	18,519	16,828	11,096	9,369
Other industries.....	—	850	754	(T)	(T)	(T)	(T)	(T)	(T)	(T)	(T)	(D)	9,491
DOD 1/													
Total.....		\$5,919	\$5,812	\$6,222	\$6,950	\$7,939	\$10,540	\$14,571	\$20,948	\$22,252	(S)	(S)	\$15,044
Chemicals and allied products.....	28	39	27	28	32	36	40	48	(S)	(D)	(S)	(D)	(D)
Machinery.....	35	426	405	442	395	541	599	963	1,287	(D)	(D)	748	58
Electrical equipment.....	36	1,643	1,570	1,607	1,692	1,920	2,338	3,057	3,812	(S)	2,229	(S)	(D)
Motor vehicles and other transportation equipment.....	371,373-75,379	251	288	337	382	(T)	(T)	(T)	(D)	(D)	(D)	(D)	888
Aircraft and missiles.....	372,376	2,992	3,120	3,408	3,900	4,210	6,121	8,888	13,918	13,717	(S)	(S)	6,373
Other industries.....	—	568	402	400	461	(T)	(T)	(T)	(D)	(D)	(D)	(D)	5,707
NASA 1/													
Total.....		\$1,095	\$1,409	\$1,804	\$1,697	\$1,786	\$2,306	\$2,150	(S)	\$2,805	(S)	(S)	(S)
Chemicals and allied products.....	28	(T)	(T)	(T)	(T)	(T)	(T)	(T)	(S)	(D)	0	(S)	2
Machinery.....	35	63	62	62	54	74	81	(T)	(D)	(D)	(D)	(D)	(D)
Electrical equipment.....	36	162	186	200	208	252	317	188	90	115	(D)	(S)	(D)
Motor vehicles and other transportation equipment.....	371,373-75,379	25	27	(T)	(T)	(T)	(T)	(T)	(T)	(D)	(D)	(D)	20
Aircraft and missiles.....	372,376	789	1,082	1,267	1,348	1,221	1,785	1,959	(S)	2,650	(S)	(S)	(S)
Other industries.....	—	1/	1/	45	44	119	70	(T)	(D)	(D)	(D)	(D)	137
DOE													
Total.....		2/	2/	2/	2/	\$1,575	\$1,976	\$1,949	\$2,901	\$2,968	\$3,221	(S)	\$2,961
Chemicals and allied products.....	28	2/	2/	2/	2/	(T)	(T)	(T)	(S)	171	(S)	(S)	(D)
Machinery.....	35	2/	2/	2/	2/	(T)	(T)	(T)	(S)	(D)	(S)	(D)	(S)
Electrical equipment.....	36	2/	2/	2/	2/	784	951	917	1,188	1,184	1,353	(S)	57
Motor vehicles and other transportation equipment.....	371,373-75,379	2/	2/	2/	2/	16	20	(T)	(T)	(D)	(D)	(D)	(D)
Aircraft and missiles.....	372,376	2/	2/	2/	2/	253	340	207	468	688	(S)	(S)	(S)
Other industries.....	—	2/	2/	2/	2/	267	356	(T)	(T)	(D)	(D)	(D)	1,197

1/ For 1974, funds were based on approximately 175 companies leading in Federal R&D funds; 1975-93 funds are based on all companies reporting Federal R&D funds.

2/ Data not tabulated for this agency prior to 1979.

KEY: (D) - Data have been withheld to avoid disclosing operations of individual companies.
 (S) - Data have been withheld due to imputation of 50 percent or more.
 (T) - Not separately available but included in total.

NOTES: Data for DOD, NASA, and DOE do not sum to the totals because the data reported by all other Federal agencies are not tabulated. In addition, Federal R&D data collected with each annual sample (on the RD-1A form) is not allocated by agency type.

Further, as a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

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Table A-15. Number of R&D-performing companies reporting Federal R&D funds and total number of R&D-performing companies, by industry and size of company: 1993

Page 1 of 1

Industry	SIC code	Size of company											
		Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees		5,000 to 9,999 employees		10,000 to 24,999 employees		25,000 or more employees	
		Total	Federal	Total	Federal	Total	Federal	Total	Federal	Total	Federal	Total	Federal
Total.....		38,330	2,864	896	34	1,185	67	238	(S)	179	36	125	55
Food, kindred, and tobacco products.....	20,21	1,463	0	57	0	71	0	22	0	10	0	11	0
Textiles and apparel.....	22,23	397	(D)	32	0	55	0	9	0	8	0	(D)	(D)
Lumber, wood products, and furniture.....	24,25	622	(D)	41	0	34	0	9	0	(D)	0	(D)	(D)
Paper and allied products.....	26	234	0	34	0	31	0	7	0	9	0	6	(D)
Chemicals and allied products.....	28	1,443	36	56	0	79	8	20	(D)	21	(D)	9	(D)
Industrial chemicals.....	281-82,286	77	0	16	0	27	5	8	(D)	8	(D)	(D)	(D)
Drugs and medicines.....	283	206	(D)	11	0	26	(D)	4	0	7	(D)	4	(D)
Other chemicals.....	284-85,287-89	1,160	(D)	29	0	26	0	8	0	6	(D)	(D)	0
Petroleum refining and extraction.....	13,29	84	(D)	4	0	15	(D)	3	0	6	3	6	3
Rubber products.....	30	612	(D)	58	0	51	0	7	0	(D)	0	(D)	0
Stone, clay, and glass products.....	32	507	93	17	0	23	(D)	5	0	6	(D)	(D)	(D)
Primary metals.....	33	561	98	22	0	50	(D)	14	(D)	6	(S)	(D)	(D)
Ferrous metals and products.....	331-32,3398-99	359	98	13	0	34	0	11	(D)	3	(D)	(D)	0
Nonferrous metals and products.....	333-36	202	0	9	0	16	(D)	3	0	3	(D)	(D)	(D)
Fabricated metal products.....	34	1,260	13	66	(D)	77	(D)	(D)	0	14	(D)	(D)	(D)
Machinery.....	35	3,921	19	127	(D)	135	(D)	25	(D)	10	3	(D)	4
Office, computing, and accounting machines.....	357	472	5	20	(D)	30	(D)	(D)	(D)	(D)	0	(D)	(D)
Other machinery, except electrical.....	351-56,358-59	3,449	14	107	0	105	(D)	(D)	(D)	(D)	3	(D)	(D)
Electrical equipment.....	36	1,941	59	90	(D)	111	10	8	(D)	9	0	10	6
Radio and TV receiving equipment.....	365	59	(D)	(D)	0	5	(D)	0	0	0	0	0	0
Communication equipment.....	366	442	(D)	(D)	0	23	(D)	0	0	(D)	0	(D)	(D)
Electronic components.....	367	572	11	32	(D)	38	5	(D)	(D)	(D)	0	(D)	(D)
Other electrical equipment.....	361-64,369	868	36	42	3	45	(D)	(D)	0	6	0	6	(D)
Transportation equipment.....	37	360	(D)	46	(D)	56	(D)	18	6	9	5	13	(D)
Motor vehicles and motor vehicles equipment.....	371	134	0	10	(D)	34	(D)	8	(D)	4	(D)	3	(D)
Other transportation equipment.....	373-75,379	195	(D)	7	0	8	0	4	(D)	(D)	0	0	0
Aircraft and missiles.....	372,376	31	0	29	(D)	14	4	6	(D)	4	4	10	10
Professional and scientific instruments.....	38	1,438	199	72	6	64	7	6	(D)	6	3	8	6
Scientific and mechanical measuring instruments.....	381-82	474	188	40	4	26	6	(D)	(D)	4	3	5	5
Optical, surgical, photographic, and other instruments.....	384-87	964	(S)	32	(D)	38	(D)	3	0	(D)	0	3	(D)
Other manufacturing industries.....	27,31,39	1,146	(D)	44	0	47	0	12	0	8	(D)	(D)	0
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	22,341	2,329	130	8	284	26	69	(S)	54	(D)	44	13

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld due to interpretation of 50 percent or more.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

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Table A-16. Industry-administered federally funded R&D centers (FFRDCs)—funds by character of work, full-time-equivalent (FTE) R&D scientists and engineers, and total number of employees: 1986-93

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Item	1986	1987	1988	1989	1990	1991	1992	1993
[Dollars in millions]								
Total R&D funds.....	\$1,891	\$1,995	\$2,122	\$2,195	\$2,323	\$2,277	\$2,353	\$1,965
Basic research.....	117	142	337	398	499	461	474	492
Applied research.....	629	623	371	374	386	433	507	435
Development.....	1,145	1,230	1,414	1,423	1,438	1,383	1,373	1,039
[Employment in thousands]								
Number of FTE R&D scientists and engineers 1/.....	7,432	8,432	10,994	11,618	12,438	11,977	11,770	8,083
Total employment 2/.....	24,156	33,804	36,143	35,716	42,153	39,697	40,755	23,930

1/ These data were recorded in January of the year following that listed.

2/ These data were recorded in March of the year listed.

NOTE: Industry-administered FFRDCs conduct R&D almost exclusively for use by the Federal Government. Data for these FFRDCs administered by industry are included in Federal R&D support shown in other tables under the industry classifications of the administering firms. See section C for a listing of industry-administered FFRDCs and their locations.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-17. Number of R&D-performing companies in manufacturing and nonmanufacturing industries, by size of company: 1993

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Size of company [Number of employees]	Total	Manufacturing	Nonmanufacturing
Total.....	40,953	18,031	22,922
Fewer than 500.....	38,330	15,989	22,341
500 to 999.....	896	766	130
1,000 to 4,999.....	1,185	901	284
5,000 to 9,999.....	238	169	69
10,000 to 24,999.....	179	125	54
25,000 or more.....	125	81	44

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-18. Concentration of total, Federal, and company and other R&D funds and net sales of R&D-performing companies, by size of R&D program: 1983-93

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Companies ranked by size of R&D program	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Percent of total (company, Federal, and other) R&D funds											
First 4 (1-4).....	19	17	18	19	19	18	19	18	16	15	16
Next 4 (5-8).....	11	13	12	11	12	12	13	13	8	8	7
Next 12 (9-20).....	17	17	17	14	16	17	16	15	12	13	13
Next 20 (21-40).....	13	13	13	13	12	12	12	12	11	11	13
Next 60 (41-100).....	17	18	16	15	14	15	15	16	15	15	16
Next 100 (101-200).....	9	9	9	10	8	8	8	9	12	12	8
Next 200 (201-400).....	6	6	5	8	6	7	6	7	6	6	7
Percent of Federal R&D funds											
First 4 (1-4).....	N/A	30	29	30	31	32	36	38	14	11	13
Next 4 (5-8).....	N/A	15	15	16	18	18	15	16	21	18	19
Next 12 (9-20).....	N/A	26	27	28	27	28	30	26	21	27	27
Next 20 (21-40).....	N/A	17	16	15	15	15	11	12	15	13	14
Next 60 (41-100).....	N/A	10	7	7	7	6	6	6	13	11	11
Next 100 (101-200).....	N/A	1	2	2	1	3	1	3	3	4	4
Next 200 (201-400).....	N/A	0	0	1	0	0	0	0	2	2	3
Percent of company and other (except Federal) R&D funds											
First 4 (1-4).....	N/A	22	23	20	20	21	22	21	17	17	17
Next 4 (5-8).....	N/A	8	7	7	7	7	7	7	7	8	7
Next 12 (9-20).....	N/A	12	12	12	12	12	13	12	10	12	9
Next 20 (21-40).....	N/A	12	12	10	11	12	12	13	10	11	12
Next 60 (41-100).....	N/A	18	18	16	16	16	16	17	16	17	17
Next 100 (101-200).....	N/A	11	10	10	10	10	10	10	15	14	9
Next 200 (201-400).....	N/A	7	7	8	8	8	8	8	7	7	8
Percent of net sales ranked by size of total R&D funds											
First 4 (1-4).....	N/A	7	8	8	7	7	6	8	7	8	8
Next 4 (5-8).....	N/A	4	4	5	5	5	5	4	3	3	3
Next 12 (9-20).....	N/A	5	5	5	5	5	5	5	4	4	4
Next 20 (21-40).....	N/A	8	8	7	7	6	5	5	4	4	4
Next 60 (41-100).....	N/A	12	12	10	11	11	12	12	12	12	11
Next 100 (101-200).....	N/A	13	13	10	8	9	8	9	9	9	9
Next 200 (201-400).....	N/A	14	15	9	12	10	11	12	11	11	10

KEY: N/A = Not available

NOTES: Companies were ranked individually for each year; therefore, particular companies comprising the size groups may have changed from year to year.

Further, as a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-19. Domestic net sales of R&D-performing companies, by industry and size of company: 1992-93

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Industry	SIC code	Total	Size of company					
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
[Dollars in millions]								
1992								
Total.....		\$2,962,991	\$262,327	\$98,364	\$427,843	\$305,880	\$587,615	\$1,291,152
Food, kindred, and tobacco products.....	20,21	263,941	10,625	6,139	40,725	30,062	47,263	129,077
Textiles and apparel.....	22,23	41,901	1,998	1,981	12,225	3,083	(D)	(D)
Lumber, wood products, and furniture.....	24,25	24,722	4,245	1,463	9,272	3,943	(D)	(D)
Paper and allied products.....	26	113,037	2,368	11,829	10,880	8,213	32,495	47,274
Chemicals and allied products.....	28	271,488	25,457	7,704	47,081	31,125	88,329	71,792
Industrial chemicals.....	281-82,288	110,399	1,834	2,462	18,415	12,815	39,433	35,440
Drugs and medicines.....	283	81,979	13,878	(D)	13,642	6,526	35,006	(D)
Other chemicals.....	284-85,287-89	79,110	9,745	(D)	15,024	11,784	13,890	(D)
Petroleum refining and extraction.....	13,29	236,594	1,649	498	8,295	15,910	76,485	133,757
Rubber products.....	30	52,892	15,399	(D)	14,749	4,339	4,933	(D)
Stone, clay, and glass products.....	32	28,813	2,168	(D)	4,266	2,741	14,272	(D)
Primary metals.....	33	85,808	4,647	(D)	20,797	15,922	19,199	(D)
Ferrous metals and products.....	331-32,3398-99	48,807	2,055	(D)	12,662	7,705	8,282	(D)
Nonferrous metals and products.....	333-36	36,999	2,592	(D)	8,135	8,217	10,917	(D)
Fabricated metal products.....	34	66,120	7,812	5,104	18,772	10,870	23,562	0
Machinery.....	35	190,025	27,636	10,286	41,275	26,932	17,406	66,490
Office, computing, and accounting machines.....	357	77,281	2,599	(D)	13,163	17,011	(D)	40,105
Other machinery, except electrical.....	351-56,358-59	112,764	25,037	(D)	28,112	9,921	(D)	26,385
Electrical equipment.....	36	235,628	39,459	8,044	32,701	12,986	41,335	101,103
Radio and TV receiving equipment.....	365	13,658	700	(D)	1,055	0	(D)	0
Communication equipment.....	366	48,167	4,852	(D)	6,489	0	(D)	(D)
Electronic components.....	367	47,406	9,332	2,774	13,062	8,983	(D)	(D)
Other electrical equipment.....	361-64,369	126,397	24,575	3,675	12,095	4,003	15,047	67,002
Transportation equipment.....	37	388,729	2,009	3,182	28,751	31,852	29,572	291,363
Motor vehicles and motor vehicles equipment.....	371	227,959	170	1,004	24,019	(D)	(D)	(D)
Other transportation equipment.....	373-75,379	13,653	945	1,086	1,317	(D)	(D)	(D)
Aircraft and missiles.....	372,376	145,117	894	1,092	3,415	4,299	16,690	118,727
Professional and scientific instruments.....	38	100,832	13,409	5,969	17,978	6,755	7,124	49,597
Scientific and mechanical measuring instruments.....	381-82	48,393	7,661	(D)	9,048	2,568	(D)	21,783
Optical, surgical, photographic, and other instruments.....	384-87	52,439	5,748	(D)	8,930	4,187	(D)	27,814
Other manufacturing industries.....	27,31,39	43,343	7,941	(D)	12,876	6,008	8,574	(D)
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	821 120	95,507	16,608	107,020	95,119	158,201	348,662

See explanatory information and SOURCE at end of table.

Table A-19. Domestic net sales of R&D-performing companies, by industry and size of company: 1992-93

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Industry	SIC code	Total	Size of company					
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
			[Dollars in millions]					
1993								
Total.....		\$3,197,899	\$261,194	\$95,178	\$515,319	\$338,672	\$624,119	\$1,363,417
Food, kindred, and tobacco products.....	20,21	283,659	13,191	9,364	50,292	36,028	41,343	133,441
Textiles and apparel.....	22,23	52,808	7,507	(D)	13,716	5,389	13,039	(D)
Lumber, wood products, and furniture.....	24,25	31,333	5,323	2,782	10,048	5,814	(D)	(D)
Paper and allied products.....	26	112,061	5,656	3,739	14,351	8,494	31,495	48,326
Chemicals and allied products.....	28	285,104	18,138	9,504	53,612	33,324	88,050	82,476
Industrial chemicals.....	281-82,286	117,477	3,104	3,055	18,915	13,482	36,385	42,536
Drugs and medicines.....	283	75,084	3,147	(D)	14,422	7,022	23,798	(D)
Other chemicals.....	284-85,287-89	92,543	11,887	(D)	20,275	12,820	(S)	(D)
Petroleum refining and extraction.....	13,29	235,180	1,957	591	18,972	11,509	92,916	109,235
Rubber products.....	30	51,115	12,395	5,223	13,738	6,850	(D)	(D)
Stone, clay, and glass products.....	32	34,611	3,903	(D)	7,003	3,448	15,233	(D)
Primary metals.....	33	87,280	5,341	(D)	21,047	19,633	15,339	(D)
Ferrous metals and products.....	331-32,3398-99	60,395	2,696	1,923	15,800	13,778	(D)	(D)
Nonferrous metals and products.....	333-36	26,885	2,645	1,231	5,247	5,855	(D)	(D)
Fabricated metal products.....	34	83,504	14,635	(D)	21,926	5,412	32,099	(D)
Machinery.....	35	181,499	32,669	13,205	48,619	33,231	25,153	28,622
Office, computing, and accounting machines.....	357	48,949	6,030	2,883	16,473	16,735	(D)	(D)
Other machinery, except electrical.....	351-56,358-59	132,550	26,639	10,322	32,146	16,496	(D)	(D)
Electrical equipment.....	36	217,523	20,071	9,649	37,080	10,369	28,836	111,518
Radio and TV receiving equipment.....	365	2,196	(D)	(D)	1,359	0	0	0
Communication equipment.....	366	33,374	(D)	1,435	8,546	0	(D)	(D)
Electronic components.....	367	64,209	7,389	3,716	14,264	(D)	(D)	(D)
Other electrical equipment.....	361-64,369	117,743	6,819	(D)	12,911	(D)	14,439	77,359
Transportation equipment.....	37	421,309	7,499	3,418	38,138	29,707	35,948	306,599
Motor vehicles and motor vehicles equipment.....	371	290,179	5,366	(D)	32,563	17,172	(D)	210,623
Other transportation equipment.....	373-75,379	12,956	1,602	(D)	1,944	6,223	(D)	0
Aircraft and missiles.....	372,376	118,174	531	1,227	3,631	6,312	10,497	95,976
Professional and scientific instruments.....	38	106,949	11,951	6,345	17,421	6,091	9,413	55,728
Scientific and mechanical measuring instruments.....	381-82	53,010	5,994	3,390	6,826	2,778	6,878	27,144
Optical, surgical, photographic, and other instruments.....	384-87	53,939	5,957	2,955	10,595	3,313	2,535	28,584
Other manufacturing industries.....	27,31,39	56,365	11,031	3,575	13,358	10,247	15,296	2,858
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	957,597	89,927	15,297	135,998	113,122	17,377	429,456

KEY: (D) = Data have been withheld to avoid disclosing of individual companies.

(S) = Data have been withheld due to imputation of more than 50 percent.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

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Table A-20. Total (company, Federal, and other) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1983-93

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Industry and size of company	SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Total.....		3.9%	3.9%	4.4%	4.7%	4.6%	4.5%	4.3%	4.2%	4.2%	4.2%	3.8%
Distribution by industry:												
Food, kindred, and tobacco products 1/.....	20,21	(D)	(D)	(D)	(D)	0.6	(D)	(D)	(D)	0.5	0.5	0.4
Textiles and apparel.....	22,23	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	0.6	(D)
Lumber, wood products, and furniture.....	24,25	0.8	0.7	0.8	0.6	0.6	(D)	0.6	0.6	(D)	(D)	(D)
Paper and allied products.....	26	(D)	(D)	(D)	(D)	(D)	(D)	0.8	1.0	1.1	(D)	(D)
Chemicals and allied products.....	28	4.4	4.7	5.0	5.2	5.3	5.3	5.4	5.3	5.4	5.5	(D)
Industrial chemicals.....	281-82,286	3.9	4.0	4.4	4.6	4.7	4.4	4.2	4.5	4.6	4.6	(D)
Drugs and medicines.....	283	(D)	(D)	(D)	8.5	(D)	8.8	(D)	(D)	8.9	9.6	12.1
Other chemicals.....	284-85,287-89	(D)	(D)	(D)	3.3	(D)	3.4	(D)	(D)	3.1	2.7	(D)
Petroleum refining and extraction.....	13,29	(D)	(D)	(D)	(D)	1.0	1.0	0.9	0.9	1.0	0.9	0.9
Rubber products.....	30	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Stone, clay, and glass products.....	32	(D)	(D)	(D)	2.5	2.6	(D)	(D)	(D)	(D)	(D)	(D)
Primary metals.....	33	1.3	(D)	(D)	(D)	0.9	0.8	0.8	0.8	0.8	0.6	0.7
Ferrous metals and products.....	331-32,3398-99	(D)	(D)	(D)	(D)	(D)	0.5	(D)	(D)	(D)	(D)	0.4
Nonferrous metals and products.....	333-36	(D)	1.2	1.4	1.5	(D)	1.0	(D)	(D)	(D)	(D)	1.4
Fabricated metal products.....	34	1.4	1.5	1.5	1.5	1.5	1.3	1.5	1.4	1.5	1.5	(D)
Machinery.....	35	6.2	6.4	7.6	(D)	(D)	7.7	7.9	7.7	8.1	7.8	4.5
Office, computing, and accounting machines.....	357	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	9.8
Other machinery, except electrical.....	351-56,358-59	(D)	(D)	(D)	3.0	3.0	2.9	(D)	(D)	(D)	(D)	2.6
Electrical equipment.....	36	7.9	6.8	7.6	7.9	8.2	7.5	7.3	6.5	6.5	5.6	5.8
Radio and TV receiving equipment.....	365	(D)	(D)	(D)	3.6	3.2	2.4	1.8	1.6	(D)	(D)	(D)
Communication equipment.....	366	11.5	9.8	10.1	9.9	10.2	10.7	11.6	10.0	(D)	(D)	(D)
Electronic components.....	367	7.7	7.8	9.6	(D)	10.0	9.0	(D)	8.3	7.9	7.5	8.2
Other electrical equipment.....	361-64,369	(D)	(D)	(D)	(D)	2.7	2.5	(D)	3.7	(D)	(D)	(D)
Transportation equipment.....	37	N/A	(D)	(D)	8.3	8.7	8.9	8.1	7.5	7.3	7.1	6.5
Motor vehicles and motor vehicles equipment.....	371	4.0	3.4	3.8	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment.....	373-75,379	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles.....	372,376	15.2	15.4	14.9	13.4	14.7	16.3	13.5	11.8	12.1	11.8	13.2

See explanatory information and SOURCE at end of table.

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Table A-20. Total (company, Federal, and other) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1983-93

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Industry and size of company	SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Professional and scientific instruments.....	38	8.6	8.3	8.9	8.8	7.9	7.4	7.2	8.0	9.1	9.4	9.6
Scientific and mechanical measuring instruments.....	381-82	(D)	(D)	(D)	(D)	(D)	7.9	7.4	8.6	10.0	10.6	11.1
Optical, surgical, photographic, and other instruments.....	384-87	(D)	(D)	(D)	(D)	(D)	7.3	7.3	7.7	8.1	8.3	8.1
Other manufacturing industries 1/.....	27,31,39	(D)	(D)	(D)	1.2	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Distribution by size of company: [Number of employees]												
Total.....		3.9%	3.9%	4.4%	4.7%	4.6%	4.5%	4.3%	4.2%	4.2%	4.2%	3.8%
Fewer than 500.....		2.5	2.9	3.6	4.1	3.9	3.7	3.6	3.4	3.3	3.4	3.7
500 to 999 2/.....		N/A	2.3	2.4	2.4	2.3	1.8	1.8	1.9	2.5	2.8	2.8
1,000 to 4,999.....		2.0	2.2	2.6	2.5	2.6	2.4	2.2	2.0	2.5	2.8	2.5
5,000 to 9,999.....		1.7	1.8	1.9	2.3	2.3	2.3	2.6	2.9	3.0	2.9	2.8
10,000 to 24,999.....		2.8	3.1	3.1	3.2	3.1	3.1	2.8	2.7	3.6	3.2	2.9
25,000 or more.....		5.5	5.3	6.2	6.5	6.6	6.3	5.8	5.6	5.6	5.6	5.2

1/ Until 1984, tobacco products (SIC 21) was included with "other manufacturing industries."

2/ For 1983, data were not broken down into this level of detail. Data are included in "Fewer than 500," above.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
N/A = Not available

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-21. Company and other (except Federal) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1983-93

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Industry and size of company	SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Total.....		2.6%	2.6%	3.0%	3.2%	3.1%	3.1%	3.1%	3.1%	3.2%	3.3%	3.1%
Distribution by industry:												
Food, kindred, and tobacco products 1/.....	20,21	0.4	0.4	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.4
Textiles and apparel.....	22,23	0.4	0.5	0.5	0.5	0.4	0.4	0.5	0.6	0.6	0.6	0.5
Lumber, wood products, and furniture.....	24,25	0.8	0.7	0.8	0.6	0.6	0.6	0.6	0.6	0.9	0.9	0.7
Paper and allied products.....	26	0.9	0.8	0.8	0.7	0.6	0.8	0.8	1.0	1.1	1.0	1.1
Chemicals and allied products.....	28	4.2	4.6	4.9	5.1	5.2	5.2	5.4	5.3	5.3	5.4	5.8
Industrial chemicals.....	281-82,286	3.4	3.8	4.2	4.4	4.4	4.2	4.1	4.4	4.4	4.4	4.4
Drugs and medicines.....	283	7.7	8.2	8.0	8.4	8.7	8.8	8.9	8.8	8.9	9.6	12.1
Other chemicals.....	284-85,287-89	2.5	2.9	3.1	3.3	3.3	3.4	3.9	3.4	3.0	2.7	2.5
Petroleum refining and extraction.....	13,29	0.7	0.7	0.9	1.1	1.0	1.0	0.9	0.9	1.0	0.9	0.8
Rubber products.....	30	1.7	1.9	1.8	1.7	1.6	1.7	1.9	2.1	2.3	2.3	2.1
Stone, clay, and glass products.....	32	1.9	1.9	2.3	2.4	2.5	2.0	1.8	1.7	1.6	1.6	1.5
Primary metals.....	33	0.8	0.9	0.9	1.0	0.9	0.7	0.7	0.8	0.8	0.6	0.7
Ferrous metals and products.....	331-32,3398-99	0.6	0.6	0.5	0.7	0.6	0.5	0.5	0.5	0.5	0.4	0.4
Nonferrous metals and products.....	333-36	1.2	1.2	1.4	1.5	1.3	1.0	1.0	1.2	1.2	0.7	1.3
Fabricated metal products.....	34	1.3	1.4	1.4	1.4	1.2	1.1	1.2	1.1	1.2	1.1	1.1
Machinery.....	35	5.4	5.8	6.7	7.3	7.1	6.8	7.3	7.2	7.5	7.3	4.5
Office, computing, and accounting machines.....	357	10.0	10.5	12.4	12.4	12.3	11.2	13.1	14.4	14.9	13.7	9.7
Other machinery, except electrical.....	351-56,358-59	2.4	2.5	2.6	2.9	3.0	2.8	2.6	2.3	2.9	2.9	2.5
Electrical equipment.....	36	5.0	4.5	4.8	5.1	5.4	5.3	5.2	4.5	4.3	4.0	5.1
Radio and TV receiving equipment.....	365	2.9	3.7	4.3	3.6	3.2	2.4	1.8	1.6	1.0	0.6	3.8
Communication equipment.....	366	7.2	5.1	5.4	5.2	5.5	6.1	6.8	6.1	(S)	7.0	9.3
Electronic components.....	367	6.6	6.6	8.2	9.2	8.5	8.0	7.7	7.4	7.2	7.0	7.9
Other electrical equipment.....	361-64,369	2.6	2.2	2.0	2.2	2.6	2.3	2.3	2.2	2.2	2.1	2.5
Transportation equipment.....	37	N/A	3.3	3.4	3.6	3.4	3.5	3.5	3.4	4.0	4.2	4.1
Motor vehicles and motor vehicles equipment.....	371	3.5	3.0	3.1	3.3	3.4	3.4	3.7	3.7	4.1	4.0	3.6
Other transportation equipment.....	373-75,379	1.7	2.0	2.3	2.7	2.5	2.6	2.5	2.1	2.1	2.1	1.2
Aircraft and missiles.....	372,376	4.1	4.0	3.9	4.0	3.6	3.9	3.3	3.1	4.0	4.7	5.2

See explanatory information and SOURCE at end of table.

Table A-21. Company and other (except Federal) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and size of company: 1983-93

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Industry and size of company	SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Professional and scientific instruments.....	38	7.7	7.6	8.3	8.2	7.5	7.1	6.8	7.1	7.1	7.2	7.0
Scientific and mechanical measuring instruments.....	381-82	8.8	8.3	8.4	8.4	8.1	7.6	6.9	6.9	6.3	6.2	6.1
Optical, surgical, photographic, and other instruments.....	384-87	7.1	7.3	8.1	8.0	7.2	7.1	7.1	7.5	8.0	8.2	7.9
Other manufacturing industries 1/.....	27,31,39	1.0	1.1	1.0	1.2	1.1	1.0	0.9	0.9	0.8	1.3	1.3
Distribution by size of company: [Number of employees]												
Total.....		2.6%	2.6%	3.0%	3.2%	3.1%	3.1%	3.1%	3.1%	3.2%	3.3%	3.1%
Fewer than 500.....		2.2	2.8	3.4	4.0	3.8	3.7	3.5	3.3	3.2	3.2	3.6
500 to 999 2/.....		N/A	2.2	2.2	2.2	2.2	1.7	1.7	1.7	2.4	2.7	2.7
1,000 to 4,999.....		2.0	2.0	2.4	2.4	2.4	2.3	2.1	1.9	2.4	2.7	2.4
5,000 to 9,999.....		1.3	1.6	1.8	2.0	2.0	2.0	2.1	2.8	2.9	2.8	2.7
10,000 to 24,999.....		2.3	2.5	2.5	2.6	2.5	2.6	2.5	2.5	3.0	2.6	2.5
25,000 or more.....		3.4	3.2	3.5	3.7	3.8	3.7	3.7	3.6	3.8	4.0	3.6

1/ Until 1984, tobacco products (SIC 21) was included with "other manufacturing industries."

2/ For 1983, data were not broken down into this level of detail. Data are included in "Fewer than 500," above.

KEY: (S) = Data have been withheld because of imputation of more than 50 percent.
N/A = Not available

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-22. Total (company, Federal, and other) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and ranked by size of R&D program: 1993

Page 1 of 1

Industry	SIC code	Total R&D funds as a percent of net sales			Total R&D funds		
		[Percent]			[Dollars in millions]		
		First 4 companies	Next 4 companies	Next 12 companies	First 4 companies	Next 4 companies	Next 12 companies
Total.....		7.5%	9.6%	10.4%	\$19,396	\$8,648	\$14,903
Food, kindred, and tobacco products.....	20,21	1.0	0.4	0.5	582	162	247
Textiles and apparel.....	22,23	1.0	0.7	0.7	89	44	57
Lumber, wood products, and furniture.....	24,25	3.0	0.8	1.0	114	41	33
Paper and allied products.....	26	3.1	0.8	0.5	823	139	115
Chemicals and allied products.....	28	7.7	8.2	6.7	7,896	3,345	4,050
Industrial chemicals.....	281-82,286	8.2	8.4	4.3	3,571	1,296	1,086
Drugs and medicines.....	283	12.6	10.4	13.8	3,021	1,785	2,673
Other chemicals.....	284-85,287-89	3.7	3.1	1.9	1,304	264	291
Petroleum refining and extraction.....	13,29	1.5	0.8	0.4	1,240	502	309
Rubber products.....	30	4.5	2.0	2.3	524	90	136
Stone, clay, and glass products.....	32	3.1	1.6	1.5	380	103	82
Primary metals.....	33	0.9	0.6	0.9	296	93	98
Ferrous metals and products.....	331-32,3398-99	0.4	0.7	0.8	95	45	57
Nonferrous metals and products.....	333-36	2.3	0.6	1.0	201	48	41
Fabricated metal products.....	34	11.2	1.4	1.1	850	165	181
Machinery.....	35	8.8	5.5	6.6	2,699	1,070	1,598
Office, computing, and accounting machines.....	357	15.4	14.4	7.2	1,694	724	1,142
Other machinery, except electrical.....	351-56,358-59	5.1	2.4	5.3	1,005	346	456
Electrical equipment.....	36	6.8	9.1	4.2	8,068	1,023	1,356
Radio and TV receiving equipment.....	365	5.1	5.4	4.1	52	16	18
Communication equipment.....	366	13.0	11.4	10.7	2,443	247	414
Electronic components.....	367	10.4	13.4	6.0	3,082	526	592
Other electrical equipment.....	361-64,369	3.7	4.8	1.9	2,491	234	332
Transportation equipment.....	37	7.4	7.6	6.7	19,736	4,595	2,820
Motor vehicles and motor vehicles equipment.....	371	5.2	1.1	1.6	11,155	271	176
Other transportation equipment.....	373-75,379	1.5	1.4	1.3	114	20	19
Aircraft and missiles.....	372,376	18.2	12.8	8.9	8,467	4,304	2,625
Professional and scientific instruments.....	38	11.7	8.5	8.6	6,234	1,054	1,049
Scientific and mechanical measuring instruments.....	381-82	15.6	7.9	9.0	3,584	721	636
Optical, surgical, photographic, and other instruments.....	384-87	8.8	10.2	7.9	2,650	333	413
Other manufacturing industries.....	27,31,39	3.3	2.6	2.4	221	109	127

NOTE: Rankings were based on total (company, Federal, and other) R&D funds.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-23. Company and other (except Federal) R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and ranked by size of company-financed R&D program: 1993

Page 1 of 1

Industry	SIC code	Company and other R&D funds as a percent of net sales			Company and other R&D funds		
		[Percent]			[Dollars in millions]		
		First 4 companies	Next 4 companies	Next 12 companies	First 4 companies	Next 4 companies	Next 12 companies
Total.....		6.4%	11.7%	6.2%	\$16,468	\$7,053	\$10,983
Food, kindred, and tobacco products.....	20,21	1.0	0.4	0.5	582	162	247
Textiles and apparel.....	22,23	1.8	0.4	0.7	81	42	57
Lumber, wood products, and furniture.....	24,25	3.0	0.8	0.9	114	41	30
Paper and allied products.....	26	2.9	0.8	0.5	783	139	115
Chemicals and allied products.....	28	7.4	5.8	6.8	7,122	2,798	3,992
Industrial chemicals.....	281-82,286	7.4	3.4	4.3	2,797	773	1,030
Drugs and medicines.....	283	12.6	10.4	13.8	3,021	1,784	2,671
Other chemicals.....	284-85,287-89	3.7	2.8	1.9	1,304	240	291
Petroleum refining and extraction.....	13,29	1.5	0.8	0.4	1,232	499	306
Rubber products.....	30	4.5	2.0	2.3	524	90	136
Stone, clay, and glass products.....	32	2.5	1.3	1.4	286	92	81
Primary metals.....	33	0.8	0.6	0.8	289	93	98
Ferrous metals and products.....	331-32,3398-99	0.4	0.7	0.8	94	45	57
Nonferrous metals and products.....	333-36	2.2	0.6	1.0	196	48	41
Fabricated metal products.....	34	1.8	1.2	1.1	205	116	158
Machinery.....	35	8.7	5.3	6.5	2,662	1,044	1,594
Office, computing, and accounting machines.....	357	15.2	14.3	7.2	1,678	719	1,137
Other machinery, except electrical.....	351-56,358-59	5.0	2.2	5.3	985	325	456
Electrical equipment.....	36	6.2	4.9	4.3	6,872	968	1,313
Radio and TV receiving equipment.....	365	4.9	3.5	4.0	50	10	18
Communication equipment.....	366	(S)	11.4	10.7	(S)	247	414
Electronic components.....	367	12.4	5.1	5.6	2,953	499	578
Other electrical equipment.....	361-64,369	2.8	2.8	1.9	1,910	211	304
Transportation equipment.....	37	5.4	2.0	1.8	14,770	1,174	813
Motor vehicles and motor vehicles equipment.....	371	4.7	1.1	1.0	10,131	271	160
Other transportation equipment.....	373-75,379	1.5	0.6	1.3	94	19	19
Aircraft and missiles.....	372,376	8.7	2.8	2.4	4,545	885	635
Professional and scientific instruments.....	38	7.7	6.8	6.7	4,090	746	889
Scientific and mechanical measuring instruments..	381-82	6.6	5.3	5.9	1,512	414	476
Optical, surgical, photographic, and other instruments.....	384-87	8.5	10.2	7.9	2,579	333	413
Other manufacturing industries.....	27,31,39	3.3	2.6	2.4	221	109	127

KEY: (S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: Rankings were based on total (company, Federal, and other) R&D funds.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-24. Federal R&D funds as a percent of net sales in R&D-performing manufacturing companies, by industry and ranked by size of federally financed R&D program: 1993

Page 1 of 1

Industry	SIC code	Federal R&D funds as a percent of net sales			Federal R&D funds		
		[Percent]			[Dollars in millions]		
		First 4 companies	Next 4 companies	Next 12 companies	First 4 companies	Next 4 companies	Next 12 companies
Total.....		6.3%	2.9%	5.2%	\$5,345	\$3,882	\$7,301
Food, kindred, and tobacco products.....	20,21	0.0	0.0	0.0	0	0	0
Textiles and apparel.....	22,23	(D)	(D)	0.0	(D)	(D)	0
Lumber, wood products, and furniture.....	24,25	(D)	0.0	0.0	(D)	0	0
Paper and allied products.....	26	(D)	0.0	0.0	(D)	0	0
Chemicals and allied products.....	28	(D)	0.1	0.0	(D)	15	6
Industrial chemicals.....	281-82,286	(D)	0.1	0.0	(D)	9	5
Drugs and medicines.....	283	0.3	0.4	0.0	9	6	0
Other chemicals.....	284-85,287-89	(D)	0.0	0.0	(D)	0	0
Petroleum refining and extraction.....	13,29	0.0	0.0	(D)	12	2	(D)
Rubber products.....	30	(D)	0.0	0.0	(D)	0	0
Stone, clay, and glass products.....	32	(D)	0.0	(D)	(D)	1	(D)
Primary metals.....	33	0.2	(D)	0.0	23	(D)	0
Ferrous metals and products.....	331-32,3398-99	0.4	(D)	0.0	17	(D)	0
Nonferrous metals and products.....	333-36	0.0	0.0	0.0	6	0	0
Fabricated metal products.....	34	(D)	0.2	1.5	(D)	10	4
Machinery.....	35	0.3	(S)	0.0	73	(S)	3
Office, computing, and accounting machines.....	357	0.5	1.6	0.0	32	2	0
Other machinery, except electrical.....	351-56,358-59	0.2	(S)	0.0	41	(S)	3
Electrical equipment.....	36	1.7	1.0	0.3	1,362	21	18
Radio and TV receiving equipment.....	365	(D)	0.0	0.0	(D)	0	0
Communication equipment.....	366	(D)	1.0	0.9	(D)	3	1
Electronic components.....	367	(S)	1.1	0.7	(S)	12	10
Other electrical equipment.....	361-64,369	(D)	0.8	0.1	(D)	6	7
Transportation equipment.....	37	4.4	2.4	4.5	6,197	2,674	1,563
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)	0.0	(D)	(D)	0
Other transportation equipment.....	373-75,379	(D)	0.0	0.0	(D)	0	0
Aircraft and missiles.....	372,376	19.7	5.5	4.5	5,132	2,670	1,563
Professional and scientific instruments.....	38	6.1	3.3	3.3	2,232	323	186
Scientific and mechanical measuring instruments.....	381-82	10.0	3.3	3.6	2,141	319	185
Optical, surgical, photographic, and other instruments.....	384-87	0.6	17.1	0.3	91	5	1
Other manufacturing industries.....	27, 31, 29	(D)	0.0	0.0	(D)	0	0

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: Rankings were based on total (company, Federal, and other) R&D funds.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-25. Total (company, Federal, and other) funds for performance of basic research, applied research, and development, in current and in constant dollars: 1953-93

Page 1 of 1

Year	Total		Basic research		Applied research		Development	
	Current dollars	Constant 1987 dollars	Current dollars	Constant 1987 dollars	Current dollars	Constant 1987 dollars	Current dollars	Constant 1987 dollars
[Dollars in millions]								
1953 1/.....	\$3,630	\$16,500	\$151	\$686	\$726	\$3,300	2,753	\$12,514
1954 1/.....	4,070	18,333	166	748	814	3,667	3,090	13,919
1955 1/.....	4,640	19,414	189	791	928	3,883	3,523	14,741
1956.....	6,605	27,987	253	1,072	1,268	5,373	5,084	21,542
1957.....	7,731	31,684	271	1,111	1,670	6,844	5,790	23,730
1958.....	8,389	33,691	295	1,185	1,911	7,675	6,183	24,831
1959.....	9,618	37,570	320	1,250	1,991	7,777	7,307	28,543
1960.....	10,509	40,419	376	1,446	2,029	7,804	8,104	31,169
1961.....	10,908	41,475	395	1,502	1,977	7,517	8,536	32,456
1962.....	11,464	42,617	488	1,814	2,449	9,104	8,527	31,699
1963.....	12,630	46,434	522	1,919	2,457	9,033	9,651	35,482
1964.....	13,512	48,780	549	1,982	2,600	9,386	10,363	37,412
1965.....	14,185	49,947	592	2,085	2,658	9,359	10,935	38,504
1966.....	15,548	52,884	624	2,122	2,843	9,670	12,081	41,092
1967.....	16,385	54,076	629	2,076	2,915	9,620	12,841	42,380
1968.....	17,429	54,808	642	2,019	3,124	9,824	13,663	42,965
1969.....	18,308	54,814	618	1,850	3,287	9,841	14,403	43,123
1970.....	18,067	51,327	602	1,710	3,427	9,736	14,038	39,881
1971.....	18,320	49,380	590	1,590	3,415	9,205	14,315	38,585
1972.....	19,552	50,392	593	1,528	3,514	9,057	15,445	39,807
1973.....	21,249	51,450	631	1,528	3,825	9,262	16,793	40,661
1974.....	22,887	50,973	699	1,557	4,288	9,550	17,900	39,866
1975.....	24,187	49,161	730	1,484	4,570	9,289	18,887	38,388
1976.....	26,997	51,620	819	1,566	5,112	9,774	21,066	40,279
1977.....	29,825	53,354	911	1,630	5,636	10,082	23,278	41,642
1978 1/.....	33,304	55,231	1,035	1,716	6,300	10,448	25,969	43,066
1979.....	38,226	58,271	1,158	1,765	7,225	11,014	29,843	45,492
1980 1/.....	44,505	62,071	1,325	1,848	8,450	11,785	34,730	48,438
1981.....	51,810	65,665	1,614	2,046	10,699	13,560	39,497	50,060
1982 1/.....	58,650	69,988	1,904	2,272	12,323	14,705	44,423	53,011
1983.....	65,268	74,849	2,223	2,549	13,927	15,971	49,118	56,328
1984.....	74,800	82,198	2,608	2,866	15,765	17,324	56,427	62,008
1985.....	84,239	89,236	2,862	3,032	18,255	19,338	63,122	66,867
1986.....	87,823	90,633	4,047	4,176	19,759	20,391	64,017	66,065
1987.....	92,155	92,155	4,324	4,324	19,813	19,813	68,018	68,018
1988.....	97,015	93,373	4,500	4,331	20,748	19,969	71,767	69,073
1989.....	102,055	94,060	5,216	4,807	22,691	20,913	74,148	68,339
1990.....	109,727	96,846	5,128	4,526	24,785	21,876	79,814	70,445
1991.....	116,952	99,449	7,837	6,664	27,446	23,338	81,669	69,446
1992.....	119,110	98,519	7,075	5,852	26,605	22,006	85,430	70,662
1993.....	118,334	95,817	7,926	6,418	24,877	20,143	85,531	69,256

1/ Character-of-work estimates were made by the National Science Foundation. See: National Science Foundation, National Patterns of R&D Resources: 1994, NSF 95-304.

NOTES: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

The 1987 GNP implicit price deflators were used to convert current dollars to constant dollars.

Further, as a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-26: Funds for performance of basic research, applied research, and development, by industry and source of funds: 1991

Page 1 of 1

Distribution by industry	SIC code	Total			Basic			Applied			Development		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[Dollars in millions]											
Total.....		\$116,952	\$26,372	\$90,580	\$7,837	\$1,712	\$6,125	\$27,446	\$6,021	\$21,425	\$81,669	\$18,639	\$63,030
Food, kindred, and tobacco products.....	20,21	1,277	0	1,277	148	0	148	453	0	453	676	0	676
Textiles and apparel.....	22,23	(D)	(D)	236	19	0	19	(D)	(D)	40	192	15	177
Lumber, wood products, and furniture.....	24,25	(D)	(D)	200	15	0	15	70	0	70	(D)	(D)	115
Paper and allied products.....	26	(D)	(D)	1,174	(D)	0	(D)	(D)	(D)	(D)	531	0	531
Chemicals and allied products.....	28	14,648	209	14,439	1,621	(S)	1,607	4,777	(S)	4,718	8,250	136	8,114
Industrial chemicals.....	281-82,286	5,390	165	5,225	549	8	541	(D)	(D)	1,410	3,391	117	3,274
Drugs and medicines.....	283	(D)	(D)	6,947	(D)	(D)	940	(D)	(D)	2,538	3,469	0	3,469
Other chemicals.....	284-85,287-89	(D)	(D)	2,267	(D)	(D)	126	785	15	770	1,390	19	1,371
Petroleum refining and extraction.....	13,29	2,498	11	2,487	(D)	(D)	231	(D)	(D)	948	1,314	6	1,308
Rubber products.....	30	(D)	(D)	(D)	(D)	(D)	(D)	400	0	400	697	0	697
Stone, clay, and glass products.....	32	(D)	(D)	455	50	0	50	(D)	(D)	160	(D)	(D)	245
Primary metals.....	33	714	8	706	38	0	38	(D)	(D)	313	(D)	(D)	355
Ferrous metals and products.....	331-32,3398-99	(D)	(D)	225	8	0	8	111	0	111	(D)	(D)	106
Nonferrous metals and products.....	333-36	(D)	(D)	481	30	0	30	(D)	(D)	202	(D)	(D)	249
Fabricated metal products.....	34	974	226	748	45	0	45	(D)	(D)	156	(D)	(D)	547
Machinery.....	35	14,775	1,055	13,720	(D)	(D)	339	(D)	(D)	2,155	11,826	600	11,226
Office, computing, and accounting machines.....	357	(D)	(D)	10,419	(D)	(D)	199	(D)	(D)	1,384	(D)	(D)	8,836
Other machinery, except electrical.....	351-56,358-59	(D)	(D)	3,301	(D)	(D)	140	793	22	771	(D)	(D)	2,390
Electrical equipment.....	36	13,415	4,550	8,865	271	24	247	(D)	(D)	2,581	8,958	2,922	6,036
Radio and TV receiving equipment.....	365	102	0	102	8	0	8	8	0	8	85	0	85
Communication equipment.....	366	(D)	(D)	(S)	(D)	(D)	53	(D)	(D)	916	(D)	(D)	2,214
Electronic components.....	367	3,465	288	3,177	(D)	(D)	106	818	(S)	771	(D)	(D)	2,300
Other electrical equipment.....	361-64,369	(D)	(D)	2,403	(D)	(D)	80	(D)	(D)	886	(D)	(D)	1,437
Transportation equipment.....	37	27,428	12,570	14,858	482	302	180	3,332	1,515	1,817	23,614	10,753	12,861
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)	9,063	95	0	95	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment.....	373-75,379	(D)	(D)	262	(S)	0	(S)	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles.....	372,376	16,983	11,450	5,533	364	302	62	2,091	1,105	986	14,528	10,043	4,485
Professional and scientific instruments.....	38	8,705	1,865	6,840	469	9	460	2,496	468	2,028	5,740	1,388	4,352
Scientific and mechanical measuring instruments.....	381-82	(D)	(D)	3,017	(D)	(D)	173	(D)	(D)	1,168	(D)	(D)	1,676
Optical, surgical, photographic, and other instruments.....	384-87	(D)	(D)	3,823	(D)	(D)	287	(D)	(D)	860	(D)	(D)	2,676
Other manufacturing industries.....	27,31,39	(D)	(D)	(D)	68	0	68	(D)	(D)	74	416	60	356
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	28,446	5,505	22,941	3,826	1,354	2,472	6,834	1,797	5,037	17,786	2,354	15,432

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

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Table A-27: Funds for performance of basic research, applied research, and development, by industry and source of funds: 1992

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Distribution by industry	SIC code	Total			Basic			Applied			Development		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
[Dollars in millions]													
Total.....		\$119,110	\$24,722	\$94,388	\$7,075	\$1,210	\$5,865	\$26,605	\$5,258	\$21,347	\$85,430	\$18,254	\$67,176
Food, kindred, and tobacco products.....	20,21	1,386	0	1,386	132	0	132	454	0	454	800	0	800
Textiles and apparel.....	22,23	(D)	(D)	261	32	0	32	(D)	(D)	37	202	10	192
Lumber, wood products, and furniture.....	24,25	(D)	(D)	234	(D)	(D)	(D)	81	0	81	(D)	(D)	(D)
Paper and allied products.....	26	(D)	(D)	1,182	(D)	0	(D)	(D)	(D)	516	(D)	0	(D)
Chemicals and allied products.....	28	15,381	(S)	15,091	(D)	(D)	1,976	5,096	17	5,079	(D)	(D)	8,036
Industrial chemicals.....	281-82,286	5,165	(S)	4,911	(D)	(D)	529	1,206	13	1,194	(D)	(D)	3,188
Drugs and medicines.....	283	7,944	(S)	7,934	(D)	(D)	1,317	(D)	(D)	2,064	(D)	(D)	3,553
Other chemicals.....	284-85,287-89	2,272	(S)	2,246	(D)	(D)	130	(D)	(D)	820	(D)	(D)	1,295
Petroleum refining and extraction.....	13,29	2,277	9	2,268	(D)	(D)	200	1,051	0	1,051	1,024	8	1,016
Rubber products.....	30	(D)	(D)	1,256	(D)	(D)	76	195	0	195	985	0	985
Stone, clay, and glass products.....	32	(D)	(D)	479	41	0	41	(D)	(D)	175	(D)	(D)	263
Primary metals.....	33	522	(S)	514	(D)	(D)	29	(D)	(D)	215	272	2	270
Ferrous metals and products.....	331-32,3398-99	(D)	(D)	221	(D)	(D)	10	96	0	96	(D)	(D)	115
Nonferrous metals and products.....	333-36	(D)	(D)	293	19	0	19	123	(S)	118	(D)	(D)	155
Fabricated metal products.....	34	1,017	294	723	(D)	(D)	53	(D)	(D)	153	801	284	517
Machinery.....	35	14,938	1,035	13,903	(D)	(D)	706	(D)	(D)	1,837	11,949	589	11,360
Office, computing, and accounting machines.....	357	(D)	(D)	10,614	(D)	(D)	556	(D)	(D)	1,023	(D)	(D)	9,035
Other machinery, except electrical.....	351-56,358-59	(D)	(D)	3,289	(D)	(D)	150	836	22	814	(D)	(D)	2,325
Electrical equipment.....	36	13,360	3,844	9,516	(D)	(D)	325	(D)	(D)	2,657	9,085	2,551	6,534
Radio and TV receiving equipment.....	365	(D)	(D)	93	8	0	8	8	0	8	(D)	(D)	77
Communication equipment.....	366	(D)	(D)	3,381	(D)	(D)	67	(D)	(D)	801	(D)	(D)	2,513
Electronic components.....	367	3,567	247	3,320	117	7	110	871	58	813	2,578	182	2,397
Other electrical equipment.....	361-64,369	(D)	(D)	2,722	(D)	(D)	140	(D)	(D)	1,035	(D)	(D)	1,549
Transportation equipment.....	37	27,494	11,202	16,292	385	235	150	2,466	1,039	1,427	24,643	9,928	14,715
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)	9,133	89	0	89	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment.....	373-75,379	(D)	(D)	289	26	0	26	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles.....	372,376	17,158	(S)	6,871	270	235	35	1,742	976	766	15,146	9,077	6,069
Professional and scientific instruments.....	38	9,542	2,221	7,321	487	8	479	2,343	366	1,977	6,712	1,847	4,865
Scientific and mechanical measuring instruments.....	381-82	5,156	2,143	3,013	(D)	(D)	150	(D)	(D)	1,046	3,604	1,787	1,817
Optical, surgical, photographic, and other instruments.....	384-87	4,386	78	4,308	(D)	(D)	329	(D)	(D)	931	3,108	60	3,048
Other manufacturing industries.....	27,31,39	(D)	(D)	599	79	0	79	(D)	(D)	100	(D)	(D)	420
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	28,933	5,570	23,363	2,308	917	1,391	7,377	1,984	5,393	19,248	2,669	16,579

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-28: Funds for performance of basic research, applied research, and development, by industry and source of funds: 1993

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Distribution by industry	SIC code	Total			Basic			Applied			Development		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
[Dollars in millions]													
Total.....		\$118,334	\$22,813	\$95,521	\$7,926	\$1,000	\$6,926	\$24,877	\$4,892	\$19,985	\$85,531	\$16,921	\$68,610
Food, kindred, and tobacco products.....	20.21	1,338	0	1,338	97	0	97	427	0	427	814	0	814
Textiles and apparel.....	22.23	(D)	(D)	288	46	0	46	(D)	(D)	37	(D)	(D)	205
Lumber, wood products, and furniture.....	24.25	(D)	(D)	248	(D)	(D)	15	88	0	88	(D)	(D)	145
Paper and allied products.....	26	(D)	(D)	1,252	195	0	195	(D)	(D)	543	514	0	514
Chemicals and allied products.....	28	(D)	(D)	16,747	2,337	12	2,325	(D)	(D)	5,951	(D)	(D)	8,471
Industrial chemicals.....	281-82,286	(D)	(D)	5,274	(D)	(D)	917	(D)	(D)	1,265	(D)	(D)	3,092
Drugs and medicines.....	283	9,147	15	9,133	(D)	(D)	1,241	3,922	8	3,914	(D)	(D)	3,978
Other chemicals.....	284-85,287-89	(D)	(D)	2,340	(D)	(D)	167	(D)	(D)	772	(D)	(D)	1,401
Petroleum refining and extraction.....	13.29	2,117	14	2,103	(D)	(D)	(D)	(D)	(D)	877	1,081	11	1,070
Rubber products.....	30	(D)	(D)	1,092	(D)	0	(D)	(D)	(D)	159	893	0	893
Stone, clay, and glass products.....	32	(D)	(D)	535	(D)	(D)	(D)	(D)	(D)	186	370	85	285
Primary metals.....	33	669	23	646	(D)	(D)	47	(D)	(D)	211	404	16	388
Ferrous metals and products.....	331-32,3398-99	289	17	272	(D)	(D)	21	(D)	(D)	86	(D)	(D)	165
Nonferrous metals and products.....	333-36	380	6	374	25	0	25	(D)	(D)	(S)	(D)	(D)	223
Fabricated metal products.....	34	(D)	(D)	920	(D)	(D)	(D)	(D)	(D)	(D)	776	203	573
Machinery.....	35	8,270	88	8,182	(D)	(D)	(D)	(D)	(D)	(D)	6,337	67	6,271
Office, computing, and accounting machines.....	357	4,811	33	4,778	(D)	(D)	90	(D)	(D)	945	3,772	28	3,743
Other machinery, except electrical.....	351-56,358-59	3,459	55	3,404	(D)	(D)	(D)	(D)	(D)	676	2,564	39	2,528
Electrical equipment.....	36	12,686	1,402	11,285	(D)	5	(D)	(D)	(D)	(D)	9,338	1,139	8,200
Radio and TV receiving equipment.....	365	(D)	(D)	84	(D)	0	(D)	(D)	(D)	(D)	(D)	(D)	63
Communication equipment.....	366	(D)	(D)	3,129	(D)	(D)	(D)	258	0	258	(D)	(D)	(D)
Electronic components.....	367	5,316	(S)	5,069	(D)	1	(D)	1,432	(S)	1,397	(D)	(D)	(D)
Other electrical equipment.....	361-64,369	(D)	(D)	2,983	(D)	(D)	(D)	(D)	(D)	1,078	(D)	(D)	(D)
Transportation equipment.....	37	27,501	10,438	17,063	(D)	(D)	153	(D)	(D)	1,058	25,161	9,309	15,852
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)	10,652	74	0	74	(D)	(D)	464	(D)	(D)	10,114
Other transportation equipment.....	373-75,379	(D)	(D)	165	47	0	47	(D)	(D)	12	(D)	(D)	105
Aircraft and missiles.....	372,376	15,615	9,369	6,246	288	256	32	1,421	839	582	13,906	8,274	5,633
Professional and scientific instruments.....	38	10,288	2,767	7,521	(D)	(D)	383	2,135	337	1,797	(D)	(D)	5,341
Scientific and mechanical measuring instruments.....	381-82	5,901	2,670	3,231	(D)	(D)	136	1,422	312	1,110	(D)	(D)	1,986
Optical, surgical, photographic, and other instruments.....	384-87	4,387	97	4,290	(D)	(D)	247	713	25	687	(D)	(D)	3,355
Other manufacturing industries.....	27,31,39	(D)	(D)	763	147	0	147	86	0	86	(D)	(D)	530
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	31,320	5,782	25,538	2,836	346	2,490	6,495	2,503	3,992	21,989	2,933	19,056

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

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Table A-29. Number of R&D-performing companies conducting basic research and total number of R&D-performing companies, by industry and size of company: 1993

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Industry	SIC code	Size of company											
		Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees		5,000 to 9,999 employees		10,000 to 24,999 employees		25,000 or more employees	
		Total	Basic research	Total	Basic research	Total	Basic research	Total	Basic research	Total	Basic research	Total	Basic research
Total.....		38,330	10,080	896	185	1,185	277	238	49	179	52	125	46
Food, kindred, and tobacco products.....	20,21	1,463	1,066	57	14	71	21	22	(D)	10	(D)	11	4
Textiles and apparel.....	22,23	397	184	32	4	55	19	(D)	(D)	8	(D)	(D)	(D)
Lumber, wood products, and furniture.....	24,25	622	151	41	5	34	5	9	(D)	(D)	(D)	(D)	(D)
Paper and allied products.....	26	234	38	34	20	31	5	7	(D)	9	(D)	6	(D)
Chemicals and allied products.....	28	1,443	344	56	14	79	28	20	8	21	13	9	5
Industrial chemicals.....	281-82,286	77	40	16	6	27	12	8	(D)	(D)	(D)	(D)	(D)
Drugs and medicines.....	283	206	19	11	3	26	7	4	(D)	7	6	4	(D)
Other chemicals.....	284-85,287-89	1,160	285	29	5	26	9	8	(D)	(D)	(D)	(D)	0
Petroleum refining and extraction.....	13,29	84	19	4	(D)	15	(D)	3	0	6	(D)	6	4
Rubber products.....	30	612	129	58	16	51	10	7	0	(D)	0	(D)	0
Stone, clay, and glass products.....	32	507	82	17	3	23	8	(D)	(D)	6	3	(D)	(D)
Primary metals.....	33	561	61	22	6	50	(D)	14	(D)	(D)	(D)	(D)	(D)
Ferrous metals and products.....	331-32,3398-99	359	15	13	(D)	34	(D)	11	(D)	(D)	0	(D)	(D)
Nonferrous metals and products.....	333-36	202	46	9	(D)	16	(D)	3	0	(D)	(D)	(D)	0
Fabricated metal products.....	34	1,260	255	66	22	77	11	(D)	0	14	(D)	(D)	(D)
Machinery.....	35	3,921	938	127	16	135	20	25	(D)	10	(D)	(D)	(D)
Office, computing, and accounting machines.....	357	472	58	20	(D)	30	(D)	(D)	0	(D)	0	(D)	(D)
Other machinery, except electrical.....	351-56,358-59	3,449	881	107	(D)	105	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Electrical equipment.....	36	1,941	393	90	11	111	23	8	(D)	9	0	10	(D)
Radio and TV receiving equipment.....	365	59	(D)	(D)	(D)	5	(D)	0	0	0	0	0	0
Communication equipment.....	366	442	(D)	(D)	(D)	23	(D)	0	0	(D)	0	(D)	0
Electronic components.....	367	572	82	32	4	38	10	(D)	(D)	(D)	0	(D)	(D)
Other electrical equipment.....	361-64,369	868	241	42	6	45	8	(D)	0	6	0	6	4
Transportation equipment.....	37	360	116	46	5	56	9	18	7	9	(D)	13	5
Motor vehicles and motor vehicles equipment.....	371	134	50	10	(D)	34	7	8	5	(D)	0	3	(D)
Other transportation equipment.....	373-75,379	195	(D)	7	(D)	8	(D)	4	(D)	(D)	(D)	0	0
Aircraft and missiles.....	372,376	31	(D)	29	(D)	14	(D)	6	(D)	4	(D)	10	(D)
Professional and scientific instruments.....	38	1,438	97	72	7	64	9	6	(D)	6	(D)	8	(D)
Scientific and mechanical measuring instruments.....	381-82	474	33	40	(D)	26	(D)	(D)	(D)	(D)	(D)	5	0
Optical, surgical, photographic, and other instruments.....	383-87	964	63	32	(D)	38	(D)	(D)	(D)	(D)	0	3	(D)
Other manufacturing industries.....	27,31,39	1,146	591	44	11	47	16	12	(D)	(D)	(D)	(D)	(D)
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	22,341	5,615	130	30	284	81	69	15	54	14	44	12

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-30. Funds for industrial applied R&D performance, by product field and source of funds: 1993

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Product field	SIC code	Total	Federal	Company
[Dollars in millions]				
Total.....		\$53,949	\$8,949	\$44,100
Food and kindred products.....	20	734	0	734
Textile mill products.....	22	69	(D)	(D)
Chemicals and allied products.....	28	9,048	95	8,953
Industrial inorganic and organic chemicals.....	281-286	504	(D)	(D)
Plastics materials and synthetic resins, rubber, and fibers.....	282	922	10	912
Drugs and medicines.....	283	6,304	10	6,294
Agricultural chemicals.....	287	429	(D)	(D)
Other chemicals.....	284-85,289	889	(D)	(D)
Petroleum refining.....	29	780	(D)	(D)
Rubber and miscellaneous plastics products.....	30	574	(D)	(D)
Stone, clay, and glass products.....	32	179	6	173
Primary metals.....	33	217	7	210
Ferrous metals and products.....	331-32,3398-99	117	4	113
Nonferrous metals and products.....	333-36	100	3	97
Fabricated metal products.....	34	1,489	835	654
Ordnance and accessories, other.....	348	566	(D)	(D)
Other fabricated metal products.....	341-47,349	923	(D)	(D)
Machinery.....	35	8,958	617	8,341
Engines and turbines.....	351	1,512	(D)	(D)
Farm machinery and equipment.....	352	(D)	(D)	170
Construction, mining, and materials handling machinery.....	353	413	10	403
Metalworking machinery and equipment.....	354	(D)	(D)	78
Office, computing, and accounting machines.....	357	6,539	(D)	(D)
Other machinery, except electrical.....	355-56,358-59	246	(D)	(D)
Electrical equipment.....	36	11,571	1,586	9,985
Electric transmission and distribution equipment.....	361,3825	118	(D)	(D)
Electrical industrial apparatus.....	362	162	20	142
Radio and TV receiving equipment.....	365	139	(D)	(D)
Communication equipment.....	366	5,026	1,030	3,996
Electronic components.....	367	4,285	356	3,929
Other electrical equipment and supplies.....	363-64,368-69	1,841	161	1,680
Transportation equipment.....	37	8,807	3,000	5,807
Motor vehicles and equipment.....	371	3,965	(D)	(D)
Other transportation equipment.....	373-75,379	765	(D)	(D)
Aircraft and parts.....	372	2,375	1,156	1,219
Guided missiles and spacecraft.....	376	1,702	1,354	348
Professional and scientific instruments.....	38, except 3825	3,095	1,024	2,071
Scientific and mechanical measuring instruments.....	381-82	1,986	998	988
Optical, surgical, photographic, and other instruments.....	383-87	1,109	26	1,083
Lumber and wood products.....	24	18	0	18
Paper and allied products.....	26	327	0	327
Leather.....	31	10	0	10
Software.....	737	2,849	(D)	(D)
Other product fields.....	—	5,228	1,345	3,883

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

NOTE: Imputation of R&D expenditures by product field was eliminated beginning in 1985. This table, therefore, contains only data reported by survey respondents. See Table A-31 for coverage ratios showing the percentage of each industry's applied research and development funds that respondents distributed by product field.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-31. Total (company, Federal, and other) funds for industrial applied R&D performance, by industry and product field: 1993

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Industry	SIC code	Coverage ratio	Applied R&D total	Food and kindred products 20	Textile mill products 22	Paper and allied products 26	Chemicals 28	Petroleum refining 29	Rubber products 30
[Dollars in millions]									
Total.....		0.49	\$53,949	\$734	\$69	\$327	\$9,048	\$780	\$574
Food, kindred, and tobacco products.....	20,21	0.63	1,241	521	0	0	0	25	0
Textiles and apparel.....	22,23	0.34	256	(D)	43	0	0	4	0
Lumber, wood products, and furniture.....	24,25	0.27	236	0	0	0	0	0	0
Paper and allied products.....	26	0.27	1,097	(D)	0	199	199	25	0
Chemicals and allied products.....	28	0.57	15,805	116	(D)	(D)	(D)	7,441	(D)
Industrial chemicals.....	281-82,286	0.51	5,707	(D)	(D)	(D)	(D)	1,392	(D)
Drugs and medicines.....	283	0.60	7,899	47	0	0	0	4,923	0
Other chemicals.....	284-85,287-89	0.63	2,197	(D)	0	(D)	(D)	1,126	0
Petroleum refining and extraction.....	13,29	0.63	1,960	0	(D)	0	0	356	557
Rubber products.....	30	0.51	1,052	0	0	(D)	(D)	51	0
Stone, clay, and glass products.....	32	0.58	584	(D)	0	(D)	(D)	85	0
Primary metals.....	33	0.40	621	0	0	(D)	(D)	(D)	(D)
Ferrous metals and products.....	331-32,3398-99	0.58	267	0	0	0	0	(D)	(D)
Nonferrous metals and products.....	333-36	0.34	355	0	0	(D)	(D)	(D)	0
Fabricated metal products.....	34	0.42	1,151	(D)	0	0	0	12	0
Machinery.....	35	0.55	7,978	(D)	(D)	0	0	6	(D)
Office, computing, and accounting machines.....	357	0.60	4,722	0	0	0	0	0	0
Other machinery, except electrical.....	351-56,358-59	0.49	3,255	(D)	(D)	0	0	6	(D)
Electrical equipment.....	36	0.44	12,340	0	0	0	0	81	(D)
Radio and TV receiving equipment.....	365	0.00	82	0	0	(D)	(D)	0	0
Communication equipment.....	366	0.20	3,545	0	0	(D)	(D)	0	0
Electronic components.....	367	0.51	5,189	0	0	0	0	3	0
Other electrical equipment.....	361-64,369	0.58	3,524	0	0	0	0	79	0
Transportation equipment.....	37	0.43	27,092	0	(D)	0	0	82	(D)
Motor vehicles and motor vehicles equipment.....	371	0.65	11,626	0	(D)	0	0	78	0
Other transportation equipment.....	373-75,379	0.26	139	0	0	0	0	0	0
Aircraft and missiles.....	372,376	0.26	15,327	0	(D)	0	0	4	(D)
Professional and scientific instruments.....	38	0.25	9,892	0	0	0	0	66	0
Scientific and mechanical measuring instruments.....	381-82	0.28	5,758	0	0	0	0	(D)	0
Optical, surgical, photographic, and other instruments.....	383-87	0.21	4,134	0	0	0	0	(D)	0
Other manufacturing industries.....	27,31,39	0.41	617	0	0	(D)	(D)	(D)	0
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	0.59	28,485	(D)	0	(D)	(D)	807	(D)

See explanatory information and SOURCE at end of table.

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Table A-31. Total (company, Federal, and other) funds for industrial applied R&D performance, by industry and product field: 1993

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Industry	SIC code	Stone, clay and glass products 32	Primary metals 33	Fabricated metal products 34	Machinery 35	Electrical equipment 36	Transportation equipment 37	Professional and scientific instruments 38	Other product fields
[Dollars in millions]									
Total.....		\$179	\$217	\$1,489	\$8,959	\$11,571	\$8,806	\$3,095	\$5,256
Food, kindred, and tobacco products.....	20,21	0	0	0	(D)	(D)	0	0	204
Textiles and apparel.....	22,23	(D)	0	0	6	(D)	0	0	19
Lumber, wood products, and furniture.....	24,25	0	0	0	0	(D)	(D)	(D)	25
Paper and allied products.....	26	(D)	0	0	10	0	0	0	52
Chemicals and allied products.....	28	5	8	(D)	14	55	45	362	323
Industrial chemicals.....	281-82,286	(D)	(D)	(D)	(D)	46	26	125	119
Drugs and medicines.....	283	0	0	(D)	(D)	0	4	213	136
Other chemicals.....	284-85,287-89	(D)	(D)	0	0	8	14	23	68
Petroleum refining and extraction.....	13,29	60	0	(D)	5	16	(D)	80	107
Rubber products.....	30	427	0	0	(D)	(D)	11	0	32
Stone, clay, and glass products.....	32	0	0	(D)	(D)	41	31	25	3
Primary metals.....	33	(D)	129	18	16	21	6	(D)	9
Ferrous metals and products.....	331-32,3398-99	(D)	(D)	(D)	6	0	5	0	0
Nonferrous metals and products.....	333-36	0	(D)	(D)	9	21	1	(D)	9
Fabricated metal products.....	34	20	17	(D)	33	19	45	14	100
Machinery.....	35	4	(D)	66	3,085	685	104	33	340
Office, computing, and accounting machines.....	357	0	0	(D)	1,875	582	0	(D)	75
Other machinery, except electrical.....	351-56,358-59	4	(D)	(D)	1,211	104	104	(D)	265
Electrical equipment.....	36	10	(D)	(D)	114	3,232	1,133	67	268
Radio and TV receiving equipment.....	365	0	0	0	0	0	0	0	0
Communication equipment.....	366	0	0	0	3	594	(D)	(D)	48
Electronic components.....	367	(D)	0	(D)	26	2,158	(D)	(D)	115
Other electrical equipment.....	361-64,369	(D)	(D)	(D)	86	480	1,116	23	105
Transportation equipment.....	37	12	55	380	930	2,126	6,854	(D)	925
Motor vehicles and motor vehicles equipment.....	371	(D)	51	(D)	429	1,513	4,683	(D)	537
Other transportation equipment.....	373-75,379	0	0	0	0	0	5	0	5
Aircraft and missiles.....	372,376	(D)	4	(D)	500	613	2,166	153	383
Professional and scientific instruments.....	38	(D)	2	(D)	68	425	328	2,249	237
Scientific and mechanical measuring instruments.....	381-82	0	0	(D)	(D)	406	328	1,589	176
Optical, surgical, photographic, and other instruments.....	383-87	(D)	2	(D)	(D)	20	0	660	61
Other manufacturing industries.....	27,31,39	(D)	0	4	15	21	0	4	161
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	6	2	20	4,651	4,924	215	100	2,451

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

NOTE: Imputation of R&D expenditures by product field was eliminated beginning in 1985. Coverage ratios show the percentage of each industry's applied research and development funds that respondents distributed by product field.

"Other product fields" includes Lumber and Wood Products (SIC 24) and Leather (SIC 31).

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

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Table A-32. Total (company, Federal, and other) funds for industrial applied R&D performance, by industry and detailed product field: 1993

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Industry	SIC code	Chemicals				
		Industrial inorganic and organic chemicals 281,286	Plastics, synthetic resins, rubber, and fibers 282	Drugs and medicines 283	Agricultural chemicals 287	Other chemicals 284-85, 289
[Dollars in millions]						
Total.....		\$504	\$922	\$6,304	\$429	\$889
Food, kindred, and tobacco products.....	20,21	0	13	0	(D)	(D)
Textiles and apparel.....	22,23	0	4	0	0	0
Lumber, wood products, and furniture.....	24,25	0	0	0	0	0
Paper and allied products.....	26	(D)	11	0	0	(D)
Chemicals and allied products.....	28	393	430	5,516	407	695
Industrial chemicals.....	281-82,286	311	(D)	(D)	174	(D)
Drugs and medicines.....	283	(D)	(D)	4,781	109	(D)
Other chemicals.....	284-85,287-89	(D)	28	(D)	124	607
Petroleum refining and extraction.....	13,29	(D)	179	0	0	(D)
Rubber products.....	30	0	(D)	0	0	(D)
Stone, clay, and glass products.....	32	(D)	50	0	0	(D)
Primary metals.....	33	0	(D)	0	0	0
Ferrous metals and products.....	331-32,3398-99	0	(D)	0	0	0
Nonferrous metals and products.....	333-36	0	(D)	0	0	0
Fabricated metal products.....	34	0	11	1	0	0
Machinery.....	35	0	(D)	0	0	(D)
Office, computing, and accounting machines.....	357	0	0	0	0	0
Other machinery, except electrical.....	351-56,358-59	0	(D)	0	0	(D)
Electrical equipment.....	36	(D)	(D)	0	0	0
Radio and TV receiving equipment.....	365	0	0	0	0	0
Communication equipment.....	366	0	0	0	0	0
Electronic components.....	367	(D)	(D)	0	0	0
Other electrical equipment.....	361-64,369	(D)	(D)	0	0	0
Transportation equipment.....	37	(D)	(D)	0	0	(D)
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)	0	0	0
Other transportation equipment.....	373-75,379	0	0	0	0	0
Aircraft and missiles.....	372,376	0	(D)	0	0	(D)
Professional and scientific instruments.....	38	0	(D)	38	0	(D)
Scientific and mechanical measuring instruments.....	381-82	0	(D)	0	0	0
Optical, surgical, photographic, and other instruments.....	383-87	0	(D)	38	0	(D)
Other manufacturing industries.....	27,31,39	0	(D)	0	0	0
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	(D)	(D)	749	20	21

See explanatory information and SOURCE at end of table.

Table A-32. Total (company, Federal, and other) funds for industrial applied R&D performance, by industry and detailed product field: 1993

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Industry	SIC code	Primary metals		Fabricated metals		Computer programming, data processing, and other computer related services 737
		Ferrous metals and products 331-32 3398-99	Nonferrous metal and products 333-36	Other fabricated metal products 341-47, 349	Ordinance and accessories 348	
[Dollars in millions]						
Total.....		\$117	\$100	\$923	\$566	\$2,849
Food, kindred, and tobacco products.....	20,21	0	0	0	0	0
Textiles and apparel.....	22,23	0	0	0	0	0
Lumber, wood products, and furniture.....	24,25	0	0	0	0	0
Paper and allied products.....	26	0	0	0	0	0
Chemicals and allied products.....	28	(D)	(D)	(D)	(D)	0
Industrial chemicals.....	281-82,286	0	(D)	(D)	(D)	0
Drugs and medicines.....	283	0	0	(D)	0	0
Other chemicals.....	284-85,287-89	(D)	0	0	0	0
Petroleum refining and extraction.....	13,29	0	0	(D)	0	(D)
Rubber products.....	30	0	0	0	0	0
Stone, clay, and glass products.....	32	0	0	(D)	0	0
Primary metals.....	33	95	34	18	0	0
Ferrous metals and products.....	331-32,3398-99	95	(D)	(D)	0	0
Nonferrous metals and products.....	333-36	0	(D)	(D)	0	0
Fabricated metal products.....	34	(D)	(D)	72	(D)	0
Machinery.....	35	0	(D)	66	0	255
Office, computing, and accounting machines.....	357	0	0	(D)	0	249
Other machinery, except electrical.....	351-56,358-59	0	(D)	(D)	0	6
Electrical equipment.....	36	0	(D)	(D)	0	91
Radio and TV receiving equipment.....	365	0	0	0	0	0
Communication equipment.....	366	0	0	0	0	(D)
Electronic components.....	367	0	0	(D)	0	(D)
Other electrical equipment.....	361-64,369	0	(D)	(D)	0	50
Transportation equipment.....	37	(D)	(D)	243	137	(D)
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)	(D)	(D)	(D)
Other transportation equipment.....	373-75,379	0	0	0	0	0
Aircraft and missiles.....	372,376	(D)	(D)	(D)	(D)	(D)
Professional and scientific instruments.....	38	(D)	(D)	9	(D)	7
Scientific and mechanical measuring instruments.....	381-82	0	0	(D)	(D)	(D)
Optical, surgical, photographic, and other instruments.....	383-87	(D)	(D)	(D)	0	(D)
Other manufacturing industries.....	27,31,39	0	0	4	0	34
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	(D)	(D)	20	0	2,420

See explanatory information and SOURCE at end of table.

Table A-32. Total (company, Federal, and other) funds for industrial applied R&D performance, by industry and detailed product field: 1993

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Industry	SIC code	Machinery					
		Engines and turbines 351	Farm machinery and equipment 352	Construction, mining, and materials handling machinery 353	Metal-working machinery and equipment 354	Office computing and accounting machines 357	Other machinery except electrical 355-56 358-59
[Dollars in millions]							
Total.....		\$1,512	(D)	\$413	(D)	\$6,539	\$246
Food, kindred, and tobacco products.....	20.21	0	0	0	0	0	(D)
Textiles and apparel.....	22.23	0	0	0	(D)	0	(D)
Lumber, wood products, and furniture.....	24.25	0	0	0	0	0	0
Paper and allied products.....	26	0	0	0	0	(D)	(D)
Chemicals and allied products.....	28	0	0	(D)	0	0	(D)
Industrial chemicals.....	281-82.286	0	0	(D)	0	0	(D)
Drugs and medicines.....	283	0	0	0	0	0	(D)
Other chemicals.....	284-85.287-89	0	0	0	0	0	0
Petroleum refining and extraction.....	13.29	0	0	(D)	0	(D)	0
Rubber products.....	30	0	0	0	0	0	(D)
Stone, clay, and glass products.....	32	0	0	0	(D)	0	0
Primary metals.....	33	0	0	(D)	(D)	(D)	(D)
Ferrous metals and products.....	331-32.3398-99	0	0	(D)	(D)	0	(D)
Nonferrous metals and products.....	333-36	0	0	0	(D)	(D)	(D)
Fabricated metal products.....	34	(D)	0	1	(D)	(D)	5
Machinery.....	35	520	(D)	321	62	1,875	(D)
Office, computing, and accounting machines.....	357	0	0	0	0	(D)	(D)
Other machinery, except electrical.....	351-56.358-59	520	(D)	321	62	(D)	(D)
Electrical equipment.....	36	(D)	0	(D)	(D)	22	(D)
Radio and TV receiving equipment.....	365	0	0	0	0	0	0
Communication equipment.....	366	0	0	0	(D)	(D)	0
Electronic components.....	367	0	0	(D)	(D)	(D)	(D)
Other electrical equipment.....	361-64.369	(D)	0	0	0	(D)	(D)
Transportation equipment.....	37	865	(D)	(D)	(D)	(D)	(D)
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)	0	0	0	0
Other transportation equipment.....	373-75.379	0	0	0	0	0	0
Aircraft and missiles.....	372.376	(D)	(D)	(D)	(D)	(D)	(D)
Professional and scientific instruments.....	38	(D)	0	0	0	(D)	25
Scientific and mechanical measuring instruments.....	381-82	(D)	0	0	0	(D)	(D)
Optical, surgical, photographic, and other instruments.....	383-87	0	0	0	0	0	(D)
Other manufacturing industries.....	27.31.39	0	0	0	0	(D)	(D)
Nonmanufacturing industries.....	07-10.12-17, 40-42.44-49, 50-59.60-65.67, 701.73.75-76, 78-79.80-81, 83-84.87.89	22	(D)	26	0	4,581	(D)

See explanatory information and SOURCE at end of table.

Table A-32. Total (company, Federal, and other) funds for industrial applied R&D performance, by industry and detailed product field: 1993

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Industry	SIC code	Electrical equipment					
		Electric transmission and distribution equipment 361,3825	Electrical industrial apparatus 362	Radio and television receiving sets, except communication types 365	Communications equipment 366	Electronic components and accessories 367	Other electrical equipment and supplies 363-64, 368-69
[Dollars in millions]							
Total.....		\$118	\$162	\$139	\$5,026	\$4,285	\$1,841
Food, kindred, and tobacco products.....	20,21	0	(D)	0	0	0	0
Textiles and apparel.....	22,23	0	0	0	(D)	0	(D)
Lumber, wood products, and furniture.....	24,25	0	0	0	0	(D)	0
Paper and allied products.....	26	0	0	0	0	0	0
Chemicals and allied products.....	28	0	(D)	0	0	(D)	0
Industrial chemicals.....	281-82,286	0	(D)	0	0	(D)	0
Drugs and medicines.....	283	0	0	0	0	0	0
Other chemicals.....	284-85,287-89	0	0	0	0	8	0
Petroleum refining and extraction.....	13,29	0	0	0	0	(D)	(D)
Rubber products.....	30	0	0	0	0	0	(D)
Stone, clay, and glass products.....	32	0	0	0	(D)	(D)	0
Primary metals.....	33	(D)	0	0	(D)	(D)	(D)
Ferrous metals and products.....	331-32,3398-99	0	0	0	(D)	0	(D)
Nonferrous metals and products.....	333-36	(D)	0	0	(D)	(D)	(D)
Fabricated metal products.....	34	(D)	6	0	(D)	7	(D)
Machinery.....	35	(D)	(D)	0	91	428	143
Office, computing, and accounting machines.....	357	0	0	0	(D)	394	(D)
Other machinery, except electrical.....	351-56,358-59	(D)	(D)	0	(D)	34	(D)
Electrical equipment.....	36	(D)	94	(D)	559	2,197	250
Radio and TV receiving equipment.....	365	0	0	0	0	0	0
Communication equipment.....	366	(D)	(D)	(D)	497	68	(D)
Electronic components.....	367	(D)	(D)	(D)	13	2,053	(D)
Other electrical equipment.....	361-64,368	46	77	0	49	76	232
Transportation equipment.....	37	(D)	(D)	(D)	284	(D)	(D)
Motor vehicles and motor vehicles equipment.....	371	(D)	0	(D)	(D)	(D)	(D)
Other transportation equipment.....	373-75,379	0	0	0	0	0	0
Aircraft and missiles.....	372,376	(D)	(D)	0	(D)	(D)	(D)
Professional and scientific instruments.....	38	(D)	(D)	(D)	145	169	97
Scientific and mechanical measuring instruments.....	381-82	(D)	(D)	(D)	145	156	(D)
Optical, surgical, photographic, and other instruments.....	383-87	0	(D)	0	0	13	(D)
Other manufacturing industries.....	27,31,39	(D)	0	0	0	(D)	(D)
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	26	(D)	(D)	3,895	936	59

See explanatory information and SOURCE at end of table.

Table A-32. Total (company, Federal, and other) funds for industrial applied R&D performance, by industry and detailed product field: 1993

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Industry	SIC code	Transportation equipment				Professional and scientific instruments	
		Motor vehicles and equipment 371	Other transportation equipment 379	Aircraft and parts 372	Guided missiles and spacecraft 376	Scientific and mechanical measuring instruments 381-82	Optical, surgical, photographic and other instruments 383-87
		[Dollars in millions]					
Total.....		\$3,965	\$765	\$2,375	\$1,702	\$1,986	\$1,109
Food, kindred, and tobacco products.....	20.21	0	0	0	0	0	0
Textiles and apparel.....	22.23	0	0	0	0	0	0
Lumber, wood products, and furniture.....	24.25	(D)	0	0	0	(D)	0
Paper and allied products.....	26	0	0	0	0	0	0
Chemicals and allied products.....	28	30	0	(D)	(D)	214	147
Industrial chemicals.....	281-82,286	(D)	0	(D)	(D)	(D)	(D)
Drugs and medicines.....	283	(D)	0	0	0	(D)	(D)
Other chemicals.....	284-85,287-89	(D)	0	0	(D)	(D)	(D)
Petroleum refining and extraction.....	13.29	0	(D)	0	0	(D)	(D)
Rubber products.....	30	(D)	0	(D)	0	0	0
Stone, clay, and glass products.....	32	30	0	(D)	0	(D)	(D)
Primary metals.....	33	(D)	(D)	(D)	0	(D)	0
Ferrous metals and products.....	331-32,3398-99	(D)	(D)	(D)	0	0	0
Nonferrous metals and products.....	333-36	0	(D)	(D)	0	(D)	0
Fabricated metal products.....	34	19	(D)	(D)	(D)	(D)	(D)
Machinery.....	35	79	15	(D)	(D)	29	3
Office, computing, and accounting machines.....	357	0	0	0	0	0	(D)
Other machinery, except electrical.....	351-56,358-59	79	15	(D)	(D)	(D)	(D)
Electrical equipment.....	36	(D)	19	(D)	0	50	17
Radio and TV receiving equipment.....	365	0	0	0	0	0	0
Communication equipment.....	366	0	(D)	(D)	0	(D)	(D)
Electronic components.....	367	(D)	0	0	0	0	(D)
Other electrical equipment.....	361-64,369	(D)	(D)	(D)	0	(D)	(D)
Transportation equipment.....	37	(D)	710	(D)	(D)	(D)	(D)
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)	(D)	(D)	(D)	0
Other transportation equipment.....	373-75,379	0	(D)	0	0	0	0
Aircraft and missiles.....	372,376	(D)	(D)	1067	536	(D)	(D)
Professional and scientific instruments.....	38	(D)	0	(D)	(D)	1,432	816
Scientific and mechanical measuring instruments.....	381-82	(D)	0	(D)	(D)	1,425	164
Optical, surgical, photographic, and other instruments.....	383-87	0	0	0	0	7	652
Other manufacturing industries.....	27,31,39	0	0	0	0	(D)	(D)
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	7	17	(D)	(D)	15	85

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

NOTE: Imputation of R&D expenditures by product field was eliminated beginning in 1985. This table, therefore, contains only data reported by survey respondents. See table A-31 for coverage ratios showing the percentage of each industry's applied research and development funds that respondents distributed by product field.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-33. Total (company, Federal, and other) funds for industrial energy R&D performance, by industry: 1983-93 and projected 1994

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Industry	SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	Projected 1994
[Dollars in millions]													
Total.....		\$4,345	\$4,446	\$3,954	\$3,358	\$3,576	\$3,706	\$3,789	\$4,004	\$4,615	\$3,225	\$2,747	\$2,761
Food, kindred, and tobacco products 1/.....	20,21	(T)	(S)	2	2	(S)	3/	(D)	(D)	(D)	(D)	0	(D)
Textiles and apparel.....	22,23	(T)	2	1	(D)	(D)	(D)	(D)	(D)	0	0	0	0
Lumber, wood products, and furniture.....	24,25	5	5	3	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Paper and allied products.....	26	3	6	(D)	(D)	1	1	(D)	(D)	(D)	1	(D)	(D)
Chemicals and allied products.....	28	345	191	162	(S)	(S)	(S)	111	417	(D)	72	(D)	(D)
Industrial chemicals.....	281-82,286	335	181	(D)	(D)	(D)	(D)	108	414	(D)	66	(D)	(D)
Drugs and medicines.....	283	(T)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	0	0
Other chemicals.....	284-85,287-89	(T)	(D)	2	2	2	4	(D)	(D)	(D)	(D)	0	0
Petroleum refining and extraction.....	13,29	1,284	1,356	1,199	999	914	1,056	1,128	1,177	1,416	1,150	798	742
Rubber products.....	30	17	16	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	2	2
Stone, clay, and glass products.....	32	7	5	(D)	(D)	1	(D)	1	(D)	(D)	(D)	(D)	(D)
Primary metals.....	33	92	(S)	(S)	74	18	21	(D)	(D)	26	3	17	21
Ferrous metals and products.....	331-32,3398-99	35	35	26	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Nonferrous metals and products.....	333-36	57	(S)	(S)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Fabricated metal products.....	34	31	(D)	8	(D)	(D)	(D)	14	49	2	(D)	(D)	0
Machinery.....	35	163	201	240	261	(D)	244	260	254	(S)	154	(D)	(D)
Office, computing, and accounting machines.....	357	(T)	(S)	12	(D)	(D)	(D)	(D)	0	(D)	(D)	0	0
Other machinery, except electrical.....	351-56,358-59	144	179	228	(D)	(D)	(D)	(D)	235	(D)	(D)	(D)	(D)
Electrical equipment.....	36	813	752	733	(D)	578	680	647	627	(D)	(D)	(D)	(D)
Radio and TV receiving equipment.....	365	0	0	0	0	0	0	0	0	0	0	0	0
Communication equipment.....	366	150	(D)	115	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Electronic components.....	367	82	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	8	14	22
Other electrical equipment.....	361-64,369	581	618	(D)	(D)	(S)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Transportation equipment.....	37	(T)	(D)	(S)	(S)	(S)	(D)	847	863	(S)	(D)	(D)	(D)
Motor vehicles and motor vehicles equipment.....	371	(T)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other transportation equipment.....	373-75,379	2	1	(D)	(D)	(D)	(D)	(D)	(D)	0	0	0	0
Aircraft and missiles.....	372,376	425	661	681	307	154	652	577	626	(D)	478	381	(S)

See explanatory information and SOURCE at end of table.

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Table A-33. Total (company, Federal, and other) funds for industrial energy R&D performance, by industry: 1983-93 and projected 1994

Page 2 of 2

Industry	SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	Projected 1994
		[Dollars in millions]											
Professional and scientific instruments.....	38	\$45	\$36	(D)	(D)	\$17	\$16	\$12	\$11	(S)	(S)	(D)	(D)
Scientific and mechanical measuring instruments.....	381-82	(T)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	0	0
Optical, surgical, photographic, and other instruments.....	384-87	(T)	(D)	(D)	0	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other manufacturing industries 1/.....	27,31,39	17	12	0	0	0	0	(D)	(D)	(D)	0	0	0
Nonmanufacturing industries 2/.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	349	424	338	328	433	551	614	730	697	594	636	664

1/ Until 1984, tobacco products, SIC 21, was included with "other manufacturing industries."

2/ Nonmanufacturing industries for 1990 and prior years included the following SICs

only: 10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 806-07, and 87.

3/ Less than \$0.5 million.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

(T) = Data are not separately available but are included in the total.

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

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Table A-34. Company and other (except Federal) funds for industrial energy R&D performance, by selected industry: 1983-93 and projected 1994

Page 1 of 1

Industry	SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	Projected 1994
[Dollars in millions]													
Total.....		\$2,842	\$2,962	\$2,537	\$2,167	\$2,410	\$2,317	\$2,418	\$2,558	\$2,691	\$2,064	\$1,694	\$1,679
Chemicals and allied products.....	28	166	169	(D)	(D)	(D)	59	97	412	(D)	(D)	(D)	(D)
Petroleum refining and extraction.....	13,29	1,218	(D)	1,145	957	911	1,050	1,124	1,174	1,409	1,143	790	735
Machinery.....	35	(T)	(D)	(D)	(D)	(D)	229	246	220	(S)	146	177	213
Electrical equipment.....	36	132	123	71	(D)	(D)	123	92	90	101	159	114	128
Aircraft and missiles.....	372,376	(T)	190	264	236	(D)	211	160	199	(D)	(D)	(D)	(D)
All other manufacturing industries.....		(T)	779	610	497	564	450	451	173	(S)	41	24	29
Nonmanufacturing industries 1/.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	143	189	84	(D)	170	195	248	290	274	281	403	393

1/ Nonmanufacturing industries for 1990 and prior years included the following SICs only:
10-11, 14-17, 40-42, 44-51, 53-54, 66, 60, 62-63, 72-73, 78, 806-07, and 87.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.
(T) = Data not separately available, but are included in total.

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-35. Federal funds for industrial energy R&D performance, by selected industry: 1983-93 and projected 1994

Page 1 of 1

Industry	SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	Projected 1994
[Dollars in millions]													
Total.....		\$1,503	\$1,484	\$1,417	\$1,191	\$1,166	\$1,389	\$1,371	\$1,446	\$1,924	\$1,141	\$1,053	\$1,082
Chemicals and allied products.....	28	179	22	(D)	(D)	(D)	13	14	5	(D)	(D)	(D)	(D)
Petroleum refining and extraction.....	13,29	66	(D)	54	42	3	6	4	3	6	7	8	(S)
Machinery.....	35	(T)	(D)	(D)	(D)	(D)	15	14	34	(S)	(D)	(D)	(D)
Electrical equipment.....	36	681	629	662	(D)	(D)	557	555	537	(D)	(D)	(D)	(D)
Aircraft and missiles.....	372,376	(T)	471	417	302	(D)	441	417	427	(D)	(D)	(D)	(D)
All other manufacturing industries.....		(T)	52	13	4	5	1	0	2	1	2	2	1
Nonmanufacturing industries 1/.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	206	235	254	(D)	263	356	367	438	423	313	233	271

1/ Nonmanufacturing industries for 1990 and prior years included the following SICs only:

10-11, 14-17, 40-42, 44-51, 53-54, 66, 60, 62-63, 72-73, 78, 806-07, and 87.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.
(T) = Data not separately available, but are included in total.

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

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Table A-36. Total (company, Federal, and other) funds for industrial energy R&D performance, by primary energy source: 1983-93 and projected 1994

Page 1 of 1

Primary energy source	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	Projected 1994
[Dollars in millions]												
Total.....	\$4,345	\$4,446	\$3,954	\$3,358	\$3,576	\$3,706	\$3,789	\$4,004	\$4,615	\$3,225	\$2,747	\$2,761
Fossil fuels.....	1,573	1,738	1,876	1,476	1,548	\$1,583	\$1,652	\$1,879	2,128	1,498	1,082	1,068
Oil.....	905	N/A	1,395	N/A	(S)	N/A	(S)	N/A	(S)	N/A	693	674
Gas.....	255	N/A	189	N/A	191	N/A	(S)	N/A	(S)	N/A	215	218
Shale.....	48	N/A	125	N/A	11	N/A	77	N/A	(S)	N/A	(D)	(D)
Coal.....	(T)	N/A	150	N/A	46	N/A	(S)	N/A	(S)	N/A	97	102
Synthetic fossil fuels.....	(T)	N/A	111	N/A	23	N/A	17	N/A	(S)	N/A	23	24
Mining.....	(T)	N/A	8	N/A	3	N/A	(S)	N/A	(S)	N/A	(D)	(D)
Other.....	(T)	N/A	31	N/A	(S)	N/A	(S)	N/A	(S)	N/A	(D)	(D)
Other fossil fuels.....	(T)	N/A	17	N/A	51	N/A	(S)	N/A	58	N/A	(D)	(D)
Nuclear.....	1,118	1,113	1,212	979	926	1,098	919	973	1,139	849	818	840
Fission.....	973	N/A	1,062	N/A	859	N/A	856	N/A	1,134	N/A	(D)	(D)
Fusion.....	145	N/A	150	N/A	(S)	N/A	63	N/A	5	N/A	(D)	(D)
Total geothermal, solar, and conservation and utilization....	1,424	1,218	471	504	421	492	612	(D)	866	608	442	421
Geothermal.....	(T)	N/A	54	N/A	48	N/A	(D)	N/A	(S)	N/A	90	90
Solar.....	(T)	N/A	96	N/A	95	N/A	(D)	N/A	(S)	N/A	59	53
Conservation and utilization.....	(T)	N/A	321	N/A	281	N/A	391	N/A	(S)	N/A	293	278
All other energy.....	230	377	395	399	(S)	533	606	681	507	271	404	432

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.
 (T) = Data are not separately available, but are included in total.
 N/A = Not available

NOTES: Detailed data for 1983, 1985, and 1987 were estimated on the basis of (a) data actually reported in those years, (b) revised data for those years reported on the 1984, 1986, and 1988 survey forms, and (c) adjustments to a new sample design in 1987.

Further, as a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

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Table A-37. Company and other (except Federal) funds for industrial energy R&D performance, by primary energy source: 1983-93 and projected 1994

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Primary energy source	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	Projected 1994
	[Dollars in millions]											
Total.....	\$2,842	\$2,962	\$2,537	\$2,167	\$2,410	\$2,317	\$2,418	\$2,558	\$2,691	\$2,084	\$1,694	\$1,679
Fossil fuels.....	1,455	1,509	1,797	(D)	(D)	1,519	1,485	1,704	1,869	1,414	1,003	982
Oil.....	(T)	N/A	1,381	N/A	(S)	N/A	(S)	N/A	(S)	N/A	(D)	(D)
Gas.....	(T)	N/A	(D)	N/A	(S)	N/A	(S)	N/A	(S)	N/A	210	213
Shale.....	(T)	N/A	124	N/A	(S)	N/A	(S)	N/A	(S)	N/A	0	0
Coal.....	(T)	N/A	(S)	N/A	29	N/A	(S)	N/A	(S)	N/A	57	56
Synthetic fossil fuels.....	(T)	N/A	91	N/A	(S)	N/A	(D)	N/A	(S)	N/A	(D)	(D)
Mining.....	(T)	N/A	8	N/A	(D)	N/A	(D)	N/A	(D)	N/A	0	0
Other.....	(T)	N/A	(S)	N/A	(D)	N/A	(S)	N/A	(D)	N/A	(D)	(D)
Other fossil fuels.....	(T)	N/A	17	N/A	(S)	N/A	(S)	N/A	(S)	N/A	(D)	(D)
Nuclear.....	90	101	150	91	109	117	39	72	46	72	58	58
Fission.....	71	N/A	135	N/A	82	N/A	27	N/A	45	N/A	(D)	(D)
Fusion.....	19	N/A	15	N/A	(S)	N/A	12	N/A	1	N/A	(D)	(D)
Total geothermal, solar, and conservation and utilization.....	1,147	1,086	313	(D)	(D)	314	416	278	478	474	307	282
Geothermal.....	(T)	N/A	27	N/A	(D)	N/A	(D)	N/A	(S)	N/A	(D)	(D)
Solar.....	(T)	N/A	51	N/A	41	N/A	(D)	N/A	(S)	N/A	(D)	(D)
Conservation and utilization.....	(T)	N/A	235	N/A	(D)	N/A	384	N/A	(S)	N/A	203	187
All other energy.....	150	267	277	(D)	(D)	367	478	504	298	124	325	357

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.
(T) = Data not separately available, but are included in total.
N/A = Not available

NOTES: Detailed data for 1983, 1985, and 1987 were estimated on the basis of (a) data actually reported in those years, (b) revised data for those years reported on the 1984, 1986, and 1988 survey forms and, (c) adjustments to a new sample design for 1987.

Further, as a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

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Table A-38. Federal funds for industrial energy R&D performance, by primary energy source: 1983-93 and projected 1994

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Primary energy source	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	Projected 1994
[Dollars in millions]												
Total.....	\$1,503	\$1,484	\$1,417	\$1,191	\$1,166	\$1,385	\$1,265	\$1,418	1,924	\$1,141	\$1,053	\$1,082
Fossil fuels.....	117	228	78	(D)	(D)	63	(D)	(D)	(S)	84	79	86
Oil.....	(T)	N/A	13	N/A	(S)	N/A	(S)	N/A	(S)	N/A	(D)	(D)
Gas.....	10	N/A	(D)	N/A	(D)	N/A	(S)	N/A	(S)	N/A	5	(S)
Shale.....	1	N/A	1	N/A	(D)	N/A	(S)	N/A	(S)	N/A	(D)	(D)
Coal.....	76	N/A	(S)	N/A	17	N/A	(S)	N/A	(S)	N/A	40	46
Synthetic fossil fuels.....	(T)	N/A	20	N/A	8	N/A	(D)	N/A	(S)	N/A	(D)	(D)
Mining.....	(T)	N/A	0	N/A	(D)	N/A	(D)	N/A	(D)	N/A	(D)	(D)
Other.....	(T)	N/A	(S)	N/A	(D)	N/A	(S)	N/A	(D)	N/A	(S)	41
Other fossil fuels.....	16	N/A	0	N/A	1	N/A	(S)	N/A	(S)	N/A	(D)	(D)
Nuclear.....	1,029	1,013	1,063	888	817	979	859	885	1,093	776	759	782
Fission.....	902	N/A	928	N/A	777	N/A	809	N/A	1,089	N/A	(D)	(D)
Fusion.....	127	N/A	135	N/A	(S)	N/A	50	N/A	4	N/A	(D)	(D)
Total geothermal, solar, and conservation and utilization.....	277	132	158	(D)	(D)	178	(D)	(D)	(S)	135	136	139
Geothermal.....	(T)	N/A	26	N/A	(D)	N/A	(D)	N/A	11	N/A	(D)	(D)
Solar.....	(T)	N/A	45	N/A	37	N/A	(D)	N/A	38	N/A	(D)	(D)
Conservation and utilization.....	80	N/A	87	N/A	(D)	N/A	(D)	N/A	(S)	N/A	(S)	91
All other energy.....	80	110	118	(D)	(D)	165	(D)	174	(S)	146	79	128

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.
(T) = Data not separately available, but are included in total.
N/A = Not available

NOTES: Detailed data for 1983, 1985, and 1987 were estimated on the basis of (a) data actually reported in those years, (b) revised data for those years reported on the 1984, 1986, and 1988 survey forms and, (c) adjustments to a new sample design for 1987.

Further, as a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-39. Number of companies performing energy R&D and total number of R&D-performing companies, by industry and size of company: 1993

Page 1 of 2

Industry	SIC code	Size of company											
		Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees		5,000 to 9,999 employees		10,000 to 24,999 employees		25,000 or more employees	
		Total	Energy	Total	Energy	Total	Energy	Total	Energy	Total	Energy	Total	Energy
Total.....		38,330	11	896	9	1,185	33	238	15	179	29	125	25
Food, kindred, and tobacco products.....	20,21	1,463	0	57	0	71	0	22	0	10	0	11	0
Textiles and apparel.....	22,23	397	0	32	0	55	0	(D)	0	8	0	(D)	0
Lumber, wood products, and furniture.....	24,25	622	0	41	0	34	(D)	9	0	(D)	0	(D)	0
Paper and allied products.....	26	234	0	34	0	31	(D)	7	(D)	9	0	6	(D)
Chemicals and allied products.....	28	1,443	0	56	0	79	(D)	20	(D)	21	(D)	9	(D)
Industrial chemicals.....	281-82,286	77	0	16	0	27	(D)	8	(D)	(D)	0	(D)	(D)
Drugs and medicines.....	283	206	0	11	0	26	0	4	0	7	0	4	0
Other chemicals.....	284-85,287-89	1,160	0	29	0	26	(D)	8	(D)	(D)	(D)	(D)	0
Petroleum refining.....	29	84	0	4	0	15	(D)	3	(D)	6	5	6	5
Rubber products.....	30	612	(D)	58	0	51	(D)	7	0	(D)	0	(D)	0
Stone, clay, and glass products.....	32	507	0	17	0	23	0	(D)	0	6	0	(D)	(D)
Primary metals.....	33	561	0	22	0	50	(D)	14	(D)	(D)	(D)	(D)	(D)
Ferrous metals and products.....	331-32,3398-99	359	0	13	0	34	(D)	11	(D)	(D)	(D)	(D)	(D)
Nonferrous metals and products.....	333-36	202	0	9	0	16	0	3	0	(D)	(D)	(D)	0
Fabricated metal products.....	34	1,260	(D)	66	0	77	0	(D)	0	14	(D)	(D)	0
Machinery.....	35	3,921	(D)	127	(D)	135	(D)	25	(D)	10	(D)	(D)	(D)
Office, computing, and accounting machines.....	357	472	0	20	0	30	0	(D)	0	(D)	0	(D)	0
Other machinery, except electrical.....	351-56,358-59	3,449	(D)	107	(D)	105	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Electrical equipment.....	36	1,941	(D)	90	(D)	111	(D)	8	(D)	9	(D)	10	(D)
Radio and TV receiving equipment.....	365	59	0	(D)	0	5	0	0	0	0	0	0	0
Communication equipment.....	366	442	0	(D)	0	23	(D)	0	0	(D)	0	(D)	0
Electronic components.....	367	572	(D)	32	0	38	(D)	(D)	(D)	(D)	0	(D)	(D)
Other electrical equipment.....	361-64,369	868	(D)	42	(D)	45	(D)	(D)	0	6	(D)	6	(D)
Transportation equipment.....	37	360	0	46	0	56	0	18	(D)	9	(D)	13	(D)
Motor vehicles & motor vehicles equipment.....	371	134	0	10	0	34	0	8	(D)	(D)	(D)	3	0
Other transportation equipment.....	373-75,379	195	0	7	0	8	0	4	0	(D)	0	0	0
Aircraft and missiles.....	372,376	31	0	29	0	14	0	6	(D)	4	(D)	10	(D)

See explanatory information and SOURCE at end of table.

Table A-39. Number of companies performing energy R&D and total number of R&D-performing companies, by industry and size of company: 1993

Page 2 of 2

Industry	SIC code	Size of company											
		Fewer than 500 employees		500 to 999 employees		1,000 to 4,999 employees		5,000 to 9,999 employees		10,000 to 24,999 employees		25,000 or more employees	
		Total	Energy	Total	Energy	Total	Energy	Total	Energy	Total	Energy	Total	Energy
Professional and scientific instruments.....	38	1,438	0	72	0	64	(D)	6	0	6	0	8	0
Scientific and mechanical measuring instruments.....	381-82	474	0	40	0	26	0	(D)	0	(D)	0	5	0
Optical, surgical, photographic, and other instruments.....	384-87	964	0	32	0	38	(D)	(D)	0	(D)	0	3	0
Other manufacturing industries.....	27,31,39	1,146	0	44	0	47	0	12	0	(D)	0	(D)	0
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	22,341	(S)	130	5	284	12	69	4	54	13	44	7

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-40. Total (company, Federal, and other) funds for industrial pollution-abatement R&D performance, by industry: 1983-93 and projected 1994

Page 1 of 2

Industry	SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	Projected 1994
[Dollars in millions]													
Total.....		(S)	\$1,060	(S)	(S)	(S)	(S)	\$1,372	\$1,044	\$1,326	\$638	\$845	\$777
Food, kindred, and tobacco products 1/.....	20,21	9	12	1	1	1	1	3	2	4	2	(S)	2
Textiles and apparel.....	22,23	(T)	(S)	2/	(D)	2/	(S)	2/	2/	(S)	(S)	0	(D)
Lumber, wood products, and furniture.....	24,25	2	(D)	1	(D)	(D)	(D)	(D)	(D)	(D)	1	1	1
Paper and allied products.....	26	6	7	8	7	7	9	19	18	13	10	14	19
Chemicals and allied products.....	28	167	158	(S)	168	117	136	178	163	188	127	(D)	(D)
Industrial chemicals.....	281-82,286	144	140	(S)	(S)	(D)	117	61	(D)	(S)	87	135	136
Drugs and medicines.....	283	11	8	(D)	(D)	(D)	(D)	(D)	(D)	16	16	(D)	(D)
Other chemicals.....	284-85,287-89	12	10	14	(D)	12	(D)	(D)	67	26	24	(D)	(D)
Petroleum refining and extraction.....	13,29	81	88	60	63	51	60	75	72	111	107	111	92
Rubber products.....	30	1	(D)	(D)	(D)	(D)	(S)	1	1	1	1	(D)	(D)
Stone, clay, and glass products.....	32	9	(S)	3	4	(D)	(D)	(D)	(D)	(D)	39	44	44
Primary metals.....	33	21	21	20	8	5	9	10	8	(S)	4	3	3
Ferrous metals and products.....	331-32,3398-99	10	13	11	2	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Nonferrous metals and products.....	333-36	11	8	9	6	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Fabricated metal products.....	34	7	14	6	(D)	(D)	(D)	1	2	5	7	14	14
Machinery.....	35	27	26	26	33	38	46	111	116	(S)	91	186	168
Office, computing, and accounting machines..	357	0	(D)	0	0	0	0	0	0	(D)	0	(D)	(D)
Other machinery, except electrical.....	351-56,358-59	27	(D)	26	33	38	46	111	116	(D)	91	(D)	(D)
Electrical equipment.....	36	18	(D)	(D)	5	(D)	(D)	9	11	(D)	(D)	(D)	(D)
Radio and TV receiving equipment.....	365	0	0	0	0	0	0	0	0	0	0	0	0
Communication equipment.....	366	(T)	(D)	1	1	(D)	(D)	7	8	(D)	(D)	(D)	(D)
Electronic components.....	367	(T)	(S)	2/	(D)	(D)	0	(D)	2	1	(D)	3	(D)
Other electrical equipment.....	361-64,369	12	(D)	(D)	(D)	(D)	(D)	(D)	1	(D)	(D)	(D)	(D)
Transportation equipment.....	37	(T)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	145	174	160
Motor vehicles & motor vehicles equipment....	371	(T)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	74	73
Other transportation equipment.....	373-75,379	(T)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	0	(D)	(D)
Aircraft and missiles.....	372,376	(T)	(D)	(S)	87	123	103	120	195	114	(D)	(D)	(D)

See explanatory information and SOURCE at end of table.

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Table A-40. Total (company, Federal, and other) funds for industrial pollution abatement R&D performance, by industry: 1983-93 and projected 1994

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Industry	SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	Projected 1994
[Dollars in millions]													
Professional and scientific instruments.....	38	\$3	\$2	\$2	(D)	(D)	\$3	(D)	\$4	\$10	\$6	\$8	\$8
Scientific and mechanical measuring instruments.....	381-82	1	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Optical, surgical, photographic, and other instruments.....	384-87	2	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Other manufacturing industries 1/.....	27,31,39	2	3	(S)	0	(D)	(D)	1	2/	(D)	(D)	(D)	(D)
Nonmanufacturing industries 3/.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	124	113	118	80	113	(S)	(S)	(S)	140	55	76	65

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

2/ Less than \$0.5 million.

3/ Nonmanufacturing industries for 1990 and prior years included the following SICs only:

10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 806-07, and 87.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

(S) = Data have been withheld because of imputation of more than 50 percent.

(T) = Data not separately available, but are included in total.

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

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**Table A-41. Company and other (except Federal) funds for industrial pollution-abatement R&D performance,
by selected industry: 1983-93 and projected 1994**

Page 1 of 1

Industry	SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	Projected 1994
[Dollars in millions]													
Total.....		(S)	(S)	(S)	(S)	(S)	(S)	(S)	\$955	(S)	\$545	\$735	\$682
Chemicals and allied products.....	28	101	(D)	(S)	(D)	(D)	(D)	(D)	163	188	126	149	139
Petroleum refining and extraction.....	13,29	82	(D)	61	63	51	60	(D)	(D)	110	106	111	92
Machinery.....	35	(T)	(D)	(D)	33	38	46	(D)	116	(S)	90	186	168
Electrical equipment.....	36	13	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles.....	372,376	17	24	(D)	(D)	62	(D)	70	(D)	51	(D)	28	(D)
All other manufacturing industries.....		(T)	565	(D)	676	(D)	(D)	737	406	(S)	84	(D)	166
Nonmanufacturing industries 1/.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	51	47	(D)	(D)	(D)	(D)	58	(D)	(D)	38	44	43

1/ Nonmanufacturing industries for 1990 and prior years included the following SICs only:
10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 806-07, and 87.

KEY: (D) - Data have been withheld to avoid disclosing operations of individual companies.
(S) - Data have been withheld because of imputation of more than 50 percent.
(T) - Data not separately available, but are included in total.

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-42. Federal funds for industrial pollution-abatement R&D performance, by selected industry: 1983-93 and projected 1994

Page 1 of 1

Industry	SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	Projected 1994
[Dollars in millions]													
Total.....		\$176	\$169	\$169	\$148	\$186	\$191	(S)	\$89	\$92	\$93	\$110	\$95
Chemicals and allied products.....	28	66	(D)	(D)	(D)	(D)	(D)	(D)	0	0	(D)	(D)	(D)
Petroleum refining and extraction...	13,29	0	(D)	0	0	0	0	(D)	(D)	(D)	(D)	0	0
Machinery.....	35	(T)	(D)	(D)	0	0	0	(D)	0	0	(D)	0	0
Electrical equipment.....	36	5	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)
Aircraft and missiles.....	372,376	(T)	(D)	(D)	(D)	61	(D)	50	(D)	(D)	(D)	(D)	(D)
All other manufacturing industries.....		(T)	(D)	(D)	(D)	(D)	0	0	(D)	(D)	2	0	3
Nonmanufacturing industries 1/.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	74	67	(D)	(D)	(D)	(D)	(D)	(D)	(D)	18	(S)	22

1/ Nonmanufacturing industries for 1990 and prior years included the following SICs only:
10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 806-07, and 87.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.
(T) = Data not separately available, but are included in total.

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-43. Total (company, Federal, and other) funds for industrial pollution-abatement R&D performance, by type of pollution: 1983-93 and projected 1994

Page 1 of 1

Type of pollution	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	Projected 1994
[Dollars in millions]												
Total.....	(S)	\$1,060	(S)	(S)	(S)	(S)	(S)	\$1,044	(S)	\$638	\$845	\$777
Air.....	(S)	1/	(S)	1/	(S)	1/	(S)	1/	(S)	1/	489	447
Automotive emission.....	(S)	1/	(D)	1/	(S)	1/	(S)	1/	(S)	1/	127	85
Electric power plant emissions.....	23	1/	12	1/	16	1/	36	1/	(S)	1/	(D)	63
All other.....	91	1/	(D)	1/	(S)	1/	(S)	1/	(S)	1/	(D)	(S)
Water.....	124	1/	(S)	1/	(S)	1/	(S)	1/	(S)	1/	87	82
Solid waste.....	108	1/	(S)	1/	206	1/	(S)	1/	(S)	1/	124	106
Other.....	54	1/	108	1/	90	1/	85	1/	(S)	1/	145	142

1/ Data not collected.

KEY: (D) - Data have been withheld to avoid disclosing operations of individual companies.
(S) - Data have been withheld because of imputation of more than 50 percent.

NOTES: Detailed data for 1983, 1985, and 1987 were estimated on the basis of (a) data actually reported in those years, (b) revised totals for those years which were reported on the 1984, 1986, and 1988 survey forms, and (c) adjustments due to a new sample design for 1987.

Further, as a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-44. Total (company, Federal, and other) funds for industrial pollution-abatement R&D performance, by type of pollution and source of funds: 1992-93 and projected 1994

Page 1 of 1

Type of pollution	1992			1993			1994 (Projected)		
	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
[Dollars in millions]									
Total.....	\$638	\$93	\$545	\$845	\$110	\$735	\$777	\$95	\$682
Air.....	1/	1/	1/	489	(S)	461	447	(S)	420
Automotive emission.....	1/	1/	1/	127	1	126	85	0	85
Electric power plant emissions.....	1/	1/	1/	(D)	(D)	65	(D)	(D)	(D)
All other.....	1/	1/	1/	(D)	(D)	270	(D)	(D)	280
Water.....	1/	1/	1/	87	6	81	82	6	76
Solid waste.....	1/	1/	1/	(D)	(D)	88	(D)	(D)	82
Other.....	1/	1/	1/	(D)	(D)	105	(D)	(D)	106

1/ Data not collected.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-45. Total (company, Federal, and other) funds for industrial R&D performance in selected years, by state: 1975-93

Page 1 of 2

Area	1975	1976	1977	1979	1981	1983	1985	1987	1989	1991	1993
(Dollars in millions)											
United States.....	\$24,187	\$26,997	\$29,825	\$38,226	\$51,810	\$65,268	\$84,239	\$92,155	\$102,055	\$116,952	\$118,334
Northeast.....	7,403	8,096	8,687	10,296	14,270	18,957	24,837	\$24,549	27,998	35,170	33,785
New England.....	2,029	2,147	2,400	3,003	3,855	4,680	7,456	7,965	8,828	(S)	10,092
Maine.....	9	21	24	40	(T)	(T)	(D)	39	33	(S)	(D)
New Hampshire.....	(T)	(T)	(T)	(T)	(T)	(T)	(D)	90	(D)	(D)	248
Vermont.....	(T)	(T)	(T)	(T)	(T)	(T)	(D)	236	(D)	(D)	(D)
Massachusetts.....	1,022	1,156	1,349	1,690	1,907	2,466	4,495	5,255	5,851	(S)	6,952
Rhode Island.....	45	22	24	49	87	171	213	224	140	174	176
Connecticut.....	832	815	876	985	1,514	1,682	2,129	2,121	2,421	1,756	2,373
Middle Atlantic.....	5,374	5,949	6,287	7,293	10,415	14,277	17,381	16,583	19,170	25,553	23,693
New York.....	2,225	2,418	2,542	2,959	4,057	5,951	7,561	6,276	8,107	9,457	8,820
New Jersey.....	1,547	1,717	1,900	2,191	3,355	4,364	5,975	5,876	6,410	8,933	8,162
Pennsylvania.....	1,602	1,814	1,845	2,143	3,003	3,963	3,844	4,430	4,653	(S)	6,711
North Central.....	5,821	6,574	7,777	10,013	12,692	15,245	19,390	23,180	24,725	28,933	28,646
East North Central.....	4,816	5,390	6,270	8,065	9,742	11,967	15,254	17,635	19,395	24,017	23,830
Ohio.....	1,139	1,183	1,323	1,635	1,781	2,282	3,067	3,415	3,964	5,406	5,144
Indiana.....	453	469	541	723	1,054	(T)	(D)	1,860	1,823	2,274	2,177
Illinois.....	1,042	1,226	1,360	1,673	2,077	2,291	(D)	4,099	4,068	5,750	5,242
Michigan.....	1,961	2,249	2,750	3,614	4,272	5,716	6,436	7,095	8,506	9,283	9,924
Wisconsin.....	221	263	296	420	558	(T)	728	1,165	1,035	1,304	1,343
West North Central.....	1,005	1,184	1,507	1,948	2,950	3,278	4,136	5,545	5,331	4,916	4,816
Minnesota.....	403	551	602	802	1,180	1,814	(D)	2,145	2,075	2,070	2,458
Iowa.....	182	144	173	150	393	287	(D)	328	365	527	533
Missouri.....	350	398	630	746	1,137	(T)	(D)	1,823	2,391	(S)	(S) 1,375
North Dakota.....	(T)	(T)	(T)	(T)	(T)	(T)	10	57	(S)	(S)	9
South Dakota.....	(T)	(T)	(T)	(T)	(T)	(T)	(S)	4	4	6	22
Nebraska.....	9	13	14	15	28	26	(D)	59	64	67	128
Kansas.....	60	76	84	216	211	293	(D)	1,128	406	(S)	(S) 292
South.....	2,964	3,442	3,691	4,496	6,987	9,292	12,948	15,938	15,389	17,696	18,206
South Atlantic.....	1,720	1,847	2,012	2,592	4,012	5,000	7,338	8,811	8,136	(S)	10,692
Delaware.....	(T)	(T)	(T)	(T)	(T)	(T)	(D)	(D)	(D)	(D)	(S) 1,181
Maryland.....	446	452	382	424	(T)	(T)	1,548	1,292	1,093	1,376	2,076
District of Columbia.....	14	8	8	33	(T)	(T)	(D)	(D)	(D)	46	(S) 540
Virginia.....	236	264	318	464	539	941	862	1,284	1,131	1,275	1,087
West Virginia.....	(T)	(T)	(T)	(T)	(T)	(T)	(D)	83	(D)	(D)	(S) 100
North Carolina.....	235	253	268	327	546	786	(D)	1,666	1,311	1,470	1,929
South Carolina.....	37	87	96	82	(T)	(T)	(D)	500	388	479	495
Georgia.....	81	91	99	147	220	348	(D)	958	722	993	860
Florida.....	348	398	462	620	1,449	(T)	1,973	2,041	2,352	(S)	2,425
East South Central.....	401	427	467	402	624	1,007	1,302	2,425	1,647	1,662	1,966
Kentucky.....	74	79	100	209	170	191	(D)	238	227	176	289
Tennessee.....	261	282	306	(T)	(T)	(T)	(D)	621	934	843	792
Alabama.....	57	56	48	62	100	187	(S)	1,523	430	596	833
Mississippi.....	10	10	13	(T)	(T)	(T)	62	42	56	(S)	52
West South Central.....	843	1,113	1,212	1,502	2,351	3,285	4,307	4,702	5,605	6,205	5,547
Arkansas.....	13	12	10	11	52	(T)	(D)	129	51	(S)	185
Louisiana.....	88	98	106	83	158	257	(D)	128	169	(S)	(S) 170
Oklahoma.....	99	116	142	174	339	407	(D)	367	333	448	311
Texas.....	643	887	954	1,233	(T)	(T)	3,762	4,077	5,051	5,439	4,892

See explanatory information and SOURCE at end of table.

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Table A-45. Total (company, Federal, and other) funds for industrial R&D performance in selected years, by state: 1975-93

Page 2 of 2

Area	1975	1976	1977	1979	1981	1983	1985	1987	1989	1991	1993
[Dollars in millions]											
West.....	\$6,165	\$6,855	\$7,379	\$10,176	\$11,873	\$17,843	\$25,570	26,207	30,998	(S)	\$36,983
Mountain.....	782	923	1,034	1,139	2,135	2,845	3,766	4,272	4,113	5,931	5,013
Montana.....	(T)	(T)	(T)	(T)	(T)	(T)	(D)	7	(D)	(S)	(D)
Idaho.....	(T)	(T)	(T)	(T)	(T)	(T)	451	467	(D)	(S)	391
Wyoming.....	(T)	(T)	(T)	(T)	(T)	2	3	4	(D)	2	15
Colorado.....	194	250	257	269	529	741	988	1,207	1,167	(S)	2,111
New Mexico.....	(T)	(T)	(T)	(T)	(T)	(T)	(D)	950	1,039	1,217	(D)
Arizona.....	243	203	200	372	758	(T)	1,079	809	921	1,080	1,042
Utah.....	91	112	132	142	265	242	(D)	774	389	407	411
Nevada.....	11	35	72	(T)	(T)	(T)	(S)	55	29	95	67
Pacific.....	5,384	5,932	6,345	9,037	9,738	14,998	21,804	21,935	26,884	(S)	31,971
Washington.....	499	610	681	(T)	(T)	(T)	2,351	2,939	2,728	3,677	(S) 4,689
Oregon.....	51	57	77	116	(T)	(T)	(D)	281	357	(S)	471
California.....	4,834	5,263	5,600	7,437	7,626	(T)	(S)	18,636	23,781	(S)	26,541
Alaska.....	(T)	(T)	(T)	(T)	(T)	(T)	(D)	10	9	21	14
Hawaii.....	(T)	(T)	(T)	(T)	(T)	(T)	13	70	9	13	255
Undistributed funds.....	1,803	2,030	2,291	3,245	(T)	3,931	1,495	2,281	2,945	772	714

KEY: (D) = Data have been withheld to avoid disclosing information about individual companies.
 (S) = Data have been flagged because of imputation of more than 50 percent for 1993. For prior years, data have been withheld.
 (T) = Data are not separately available but included on total. See general notes.

NOTES: The 1991 data collected during the 1993 survey includes respondent revisions for both total R&D and state R&D allocations. Companies new to the survey may not have reported 1991 state data on their 1993 form. For companies such as these, 1991 state data were allocated to the state in which the company's headquarters was located.

Further, as a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-46. Total (company, Federal, and other) funds for industrial R&D performance, by state and source of funds: 1993

Page 1 of 2

Area	Total	Federal	Company
[Dollars in millions]			
United States.....	\$118,334	\$22,813	\$95,521
Northeast.....	33,785	5,223	28,562
New England.....	10,092	2,311	7,781
Maine.....	(D)	(D)	59
New Hampshire.....	248	(D)	(D)
Vermont.....	(D)	0	(D)
Massachusetts.....	6,952	1,878	5,074
Rhode Island.....	178	12	164
Connecticut.....	2,373	419	1,954
Middle Atlantic.....	23,693	2,912	20,781
New York.....	8,820	1,392	7,428
New Jersey.....	8,182	378	7,784
Pennsylvania.....	6,711	(S) 1,142	5,569
North Central.....	28,646	(S) 2,458	26,188
East North Central.....	23,830	(S) 1,642	22,188
Ohio.....	5,144	(S) 1,030	4,114
Indiana.....	2,177	(D)	(D)
Illinois.....	5,242	(S) 236	5,006
Michigan.....	9,924	153	9,771
Wisconsin.....	1,343	(D)	(D)
West North Central.....	(S) 4,816	(S) 816	(S) 4,000
Minnesota.....	2,458	378	2,080
Iowa.....	533	(D)	(D)
Missouri.....	(S) 1,375	(D)	(D)
North Dakota.....	9	(D)	(D)
South Dakota.....	22	(D)	(D)
Nebraska.....	128	14	114
Kansas.....	(S) 292	(S) 47	(S) 245
South.....	18,206	4,602	13,604
South Atlantic.....	10,692	3,078	7,614
Delaware.....	(S) 1,181	24	(S) 1,157
Maryland.....	2,076	1,287	789
District of Columbia.....	(S) 540	21	(S) 519
Virginia.....	1,087	595	492
West Virginia.....	(S) 100	(D)	(D)
North Carolina.....	1,929	(S) 18	1,913
South Carolina.....	495	(D)	(D)
Georgia.....	860	63	797
Florida.....	2,425	970	1,455
East South Central.....	1,966	865	1,101
Kentucky.....	289	7	282
Tennessee.....	792	(D)	(D)
Alabama.....	833	406	427
Mississippi.....	52	(D)	(D)
West South Central.....	5,547	658	4,889
Arkansas.....	185	(D)	(D)
Louisiana.....	(S) 170	(D)	(D)
Oklahoma.....	311	2	309
Texas.....	4,882	640	4,242

See explanatory information and SOURCE at end of table.

Table A-46. Total (company, Federal, and other) funds for industrial R&D performance, by state and source of funds: 1993

Page 2 of 2

Area	Total	Federal	Company
[Dollars in millions]			
West.....	\$36,983	\$10,044	\$26,939
Mountain.....	5,013	1,651	3,362
Montana.....	(D)	(D)	14
Idaho.....	391	(D)	(D)
Wyoming.....	15	0	15
Colorado.....	2,111	(S) 251	1,859
New Mexico.....	(D)	(D)	43
Arizona.....	1,042	298	744
Utah.....	411	51	360
Nevada.....	67	(D)	(D)
Pacific.....	31,971	8,393	23,578
Washington.....	(S) 4,689	(S) 891	(S) 3,798
Oregon.....	471	32	439
California.....	26,541	7,463	19,078
Alaska.....	14	(D)	(D)
Hawaii.....	255	(D)	(D)
Undistributed funds.....	714	486	228

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been flagged because of imputation of more than 50 percent.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-47. Total (company, Federal, and other) funds for industrial R&D performance, by industry and type of cost: 1993

Page 1 of 1

Industry	SIC code	R&D costs	Wages of R&D personnel	Materials and supplies	Overhead costs
			[Percent]		
Total.....		\$118,334	42.3	16.4	41.3
Food, kindred, and tobacco products.....	20,21	1,338	48.8	13.8	37.3
Textiles and apparel.....	22,23	(D)	46.7	26.2	27.2
Lumber, wood products, and furniture.....	24,25	(D)	57.8	8.6	33.6
Paper and allied products.....	26	(D)	51.9	18.1	30.0
Chemicals and allied products.....	28	(D)	41.7	13.6	44.7
Industrial chemicals.....	281-82,286	(D)	44.3	17.6	38.1
Drugs and medicines.....	283	9,147	38.7	12.0	49.3
Other chemicals.....	284-85,287-89	(D)	45.4	9.0	45.5
Petroleum refining and extraction.....	13,29	2,117	41.7	15.6	42.7
Rubber products.....	30	(D)	49.5	14.6	35.9
Stone, clay, and glass products.....	32	(D)	45.4	11.2	43.4
Primary metals.....	33	669	47.3	18.8	33.9
Ferrous metals and products.....	331-32,3398-99	289	51.8	9.6	38.5
Nonferrous metals and products.....	333-36	380	43.9	25.7	30.4
Fabricated metal products.....	34	(D)	44.1	17.0	38.9
Machinery.....	35	8,270	50.6	14.5	35.0
Office, computing, and accounting machines.....	357	4,811	51.0	9.6	39.4
Other machinery, except electrical.....	351-56,358-59	3,459	49.9	21.3	28.8
Electrical equipment.....	36	12,686	43.9	18.5	37.5
Radio and TV receiving equipment.....	365	(D)	53.7	9.7	36.6
Communication equipment.....	366	(D)	49.7	15.7	34.6
Electronic components.....	367	5,316	46.8	14.6	38.7
Other electrical equipment.....	361-64,369	(D)	33.8	27.4	38.7
Transportation equipment.....	37	27,501	34.0	21.6	44.3
Motor vehicles and motor vehicles equipment.....	371	(D)	37.7	27.5	34.8
Other transportation equipment.....	373-75,379	(D)	71.1	8.5	20.4
Aircraft and missiles.....	372,376	15,615	30.8	17.4	51.8
Professional and scientific instruments.....	38	10,288	47.5	16.5	35.9
Scientific and mechanical measuring instruments.....	381-82	5,901	45.7	13.8	40.5
Optical, surgical, photographic, and other instruments.....	383-87	4,387	50.0	20.2	29.8
Other manufacturing industries.....	27,31,39	(D)	60.2	12.3	27.4
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	31,220	43.6	13.3	43.1

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

**Table A-48. Number of full-time-equivalent (FTE) R&D scientists and engineers in
R&D-performing companies, by industry and size of company: 1984-94**

Page 1 of 2

Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	Projected 1994
[In thousands]												
Total (January).....		584.1	622.5	671.0	695.8	708.6	722.5	743.6	773.4	779.3	764.7	764.3
Total (Annual average).....		603.3	646.8	683.4	702.2	715.6	733.0	758.5	776.4	783.8	764.5	N/A
Distribution by industry:												
Food, kindred, and tobacco products 1/.....	20,21	7.4	(S)	(S)	(S)	(S)	(S)	(S)	9.4	9.8	9.6	10.1
Textiles and apparel.....	22,23	2.3	2.8	2.6	2.4	2.4	2.5	2.8	(S)	2.8	3.1	3.4
Lumber, wood products, and furniture.....	24,25	(T)	(S)	(S)	1.3	1.3	1.4	(S)	(S)	1.5	1.6	4.9
Paper and allied products.....	26	6.6	6.6	6.4	6.0	6.1	6.4	8.5	(S)	10.7	10.6	10.9
Chemicals and allied products.....	28	69.8	71.1	75.8	75.2	75.8	78.3	80.4	81.6	85.6	86.5	94.9
Industrial chemicals.....	281-82,286	25.6	23.5	24.9	(S)	(S)	(S)	(S)	(S)	29.9	26.4	29.7
Drugs and medicines.....	283	(T)	30.8	31.8	32.6	33.0	34.4	34.3	35.4	38.7	42.3	48.2
Other chemicals.....	284-85,287-89	13.4	16.7	19.1	20.2	20.3	18.8	18.9	17.0	17.0	17.8	17.0
Petroleum refining and extraction.....	13,29	13.3	13.5	10.4	9.9	9.5	10.7	11.1	11.4	11.5	11.0	10.2
Rubber products.....	30	(T)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	14.8	13.0	9.0
Stone, clay, and glass products.....	32	5.6	6.6	7.5	8.6	8.6	7.6	7.0	6.0	5.3	5.1	5.2
Primary metals.....	33	8.4	7.1	5.7	5.5	5.6	5.5	5.2	4.6	5.1	4.6	5.1
Ferrous metals and products.....	331-32,3398-99	5.3	4.2	2.5	(S)	2.3	2.3	(S)	(S)	1.7	1.6	2.6
Nonferrous metals and products.....	333-36	3.1	2.9	3.2	3.4	3.3	3.3	3.3	3.0	(S)	(S)	2.5
Fabricated metal products.....	34	16.6	(S)	(S)	9.9	10.5	9.9	10.1	(S)	8.7	7.9	13.1
Machinery.....	35	87.0	81.7	89.7	95.8	98.4	100.4	113.3	109.7	99.3	97.4	69.1
Office, computing, and accounting machines.....	357	56.5	61.8	71.9	73.4	74.4	75.0	84.7	77.6	67.1	65.8	33.7
Other machinery, except electrical.....	351-56,358-59	30.5	19.9	17.8	22.4	24.0	25.4	28.6	32.1	32.2	31.6	35.4
Electrical equipment.....	36	113.2	113.2	117.9	130.4	132.5	122.5	105.2	95.9	91.9	89.2	92.3
Radio and TV receiving equipment.....	365	(T)	(S)	1.8	1.2	1.3	1.5	0.8	1.0	1.0	1.0	0.8
Communication equipment.....	366	59.3	62.2	65.0	71.9	73.1	58.0	47.1	35.8	31.2	(S)	(S)
Electronic components.....	367	(T)	29.2	(S)	43.7	44.3	42.8	(S)	32.6	28.4	28.9	40.0
Other electrical equipment.....	361-64,369	18.4	17.9	16.5	13.6	(S)	(S)	21.3	(S)	31.2	28.8	20.8
Transportation equipment.....	37	(T)	180.3	179.2	187.3	188.2	185.4	170.2	149.7	141.1	147.5	125.9
Motor vehicles and motor vehicles equipment.....	371	28.6	28.7	33.9	46.5	47.3	45.8	49.4	45.3	44.5	45.1	51.0
Other transportation equipment.....	373-75,379	(T)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)
Aircraft and missiles.....	372,376	111.5	130.2	144.8	136.3	136.4	134.8	115.3	100.2	92.9	97.9	72.4

See explanatory information and SOURCE at end of table.

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Table A-48. Number of full-time-equivalent (FTE) R&D scientists and engineers in R&D-performing companies, by industry and size of company: 1984-94

Page 2 of 2

Industry and size of company	SIC code	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	Projected 1994
[In thousands]												
Distribution by industry:												
Professional and scientific instruments.....	38	(T)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)
Scientific and mechanical measuring instruments.....	381-82	(T)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)
Optical, surgical, photographic, and other instruments.....	384-87	(T)	19.8	24.0	24.6	24.9	14.5	8.1	(S)	(S)	20.8	34.3
Other manufacturing industries 1/.....	27,31,39	(T)	(S)	(S)	6.3	6.4	5.4	5.6	(S)	6.0	5.8	15.5
Nonmanufacturing industries 2/.....	07-10, 12-17, 40-42, 44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	49.8	66.8	75.1	96.4	101.9	125.2	(S)	(S)	202.6	196.5	190.9
Distribution by size of company:												
[Number of employees]												
Fewer than 500.....		81.9	78.3	(S)	105.2	109.0	105.4	(S)	(S)	142.1	125.1	150.2
500 to 999 3/.....		N/A	16.5	(S)	18.4	19.3	18.0	18.6	18.6	46.2	46.1	27.4
1,000 to 4,999.....		52.6	61.6	66.7	76.4	81.9	76.1	75.4	79.3	94.2	99.3	108.4
5,000 to 9,999.....		30.1	28.5	38.9	40.5	40.2	47.3	57.2	55.1	57.6	56.4	57.4
10,000 to 24,999.....		84.0	89.9	88.4	92.0	94.5	87.0	73.9	90.3	99.9	102.6	88.3
25,000 or more.....		335.5	347.6	365.3	363.3	363.7	388.7	404.2	408.4	339.2	335.2	332.6

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

2/ Nonmanufacturing industries for 1990 and prior years included the following SICs only:

10-11, 14-17, 40-42, 44-51, 53-54, 66, 60, 62-63, 72-73, 78, 806-07, and 87.

3/ For 1984, data were not broken down into this level of detail. Data are included in "Fewer than 500," above.

KEY: (S) = Data have been withheld because of imputation of more than 50 percent.

(T) = Data not separately available, but are included in total.

N/A = Not available

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-49. Number of full-time-equivalent (FTE) R&D scientists and engineers in R&D-performing companies, by industry and source of R&D funds: January 1994

Page 1 of 1

Industry	SIC code	Total	Federal	Company
[In thousands]				
Total.....		764.2	(S)	(S)
Food, kindred, and tobacco products.....	20,21	10.1	0.0	10.1
Textiles and apparel.....	22,23	3.4	(D)	(D)
Lumber, wood products, and furniture.....	24,25	4.9	(D)	(D)
Paper and allied products.....	26	10.9	(D)	(D)
Chemicals and allied products.....	28	94.9	4.5	(S)
Industrial chemicals.....	281-82,286	29.7	(D)	(D)
Drugs and medicines.....	283	48.2	0.0	(S)
Other chemicals.....	284-85,287-89	17.0	(D)	(D)
Petroleum refining and extraction.....	13,29	10.2	0.1	10.1
Rubber products.....	30	9.0	0.0	(S)
Stone, clay, and glass products.....	32	5.2	(D)	(D)
Primary metals.....	33	5.1	0.6	(S)
Ferrous metals and products.....	331-32,3368-99	2.6	(D)	(D)
Nonferrous metals and products.....	333-36	2.5	(S)	(S)
Fabricated metal products.....	34	13.1	(D)	(D)
Machinery.....	35	69.1	(S)	(S)
Office, computing, and accounting machines.....	357	33.7	(S)	(S)
Other machinery, except electrical.....	351-56,358-59	35.4	(S)	(S)
Electrical equipment.....	36	92.3	(S)	(S)
Radio and TV receiving equipment.....	365	0.8	(D)	(D)
Communication equipment.....	366	(S)	(D)	(D)
Electronic components.....	367	40.0	(S)	34.0
Other electrical equipment.....	361-64,369	20.8	(D)	(D)
Transportation equipment.....	37	125.9	(S)	(S)
Motor vehicles and motor vehicles equipment.....	371	51.0	(D)	(D)
Other transportation equipment.....	373-75,379	(S)	(D)	(D)
Aircraft and missiles.....	372,376	72.4	(S)	(S)
Professional and scientific instruments.....	38	(S)	(S)	(S)
Scientific and mechanical measuring instruments.....	381-82	(S)	(S)	(S)
Optical, surgical, photographic, and other instruments.....	383-87	34.3	(S)	(S)
Other manufacturing industries.....	27,31,39	15.5	(D)	(D)
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	190.9	28.6	162.3

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-50. Cost per R&D scientist or engineer in R&D-performing companies, by industry and size of company: 1983-93

Page 1 of 2

Industry and size of company	SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Total.....		\$116,000	\$124,000	\$130,200	\$128,500	\$128,800	\$132,300	\$134,500	\$141,300	\$148,600	\$157,912	\$154,814
Distribution by industry:												
Food, kindred, and tobacco products 1/.....	20,21	(D)	(D)	(D)	(D)	(S)	(D)	(D)	(D)	130,000	144,215	135,425
Textiles and apparel.....	22,23	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	95,016	92,696
Lumber, wood products, and furniture.....	24,25	(S)	115,400	116,300	(S)	(S)	(D)	(S)	(S)	(D)	174,086	78,050
Paper and allied products.....	26	(D)	(D)	(D)	(D)	(D)	(D)	(S)	(S)	(D)	116,704	120,378
Chemicals and allied products.....	28	104,800	112,500	116,300	117,100	125,000	139,400	149,000	159,000	167,600	183,508	200,611
Industrial chemicals.....	281-82,286	123,100	132,000	144,600	150,200	(S)	(S)	(S)	(S)	181,000	193,871	234,634
Drugs and medicines.....	283	103,100	(D)	(D)	113,600	(D)	142,800	(D)	(D)	(D)	196,631	202,129
Other chemicals.....	284-85,287-89	(D)	(D)	(D)	83,100	(D)	105,600	(D)	(D)	(D)	135,423	139,731
Petroleum refining and extraction.....	13,29	(D)	(D)	(D)	(D)	187,400	182,700	194,000	201,800	217,000	205,318	199,722
Rubber products.....	30	75,400	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	98,207	99,391
Stone, clay, and glass products.....	32	(D)	(D)	(D)	118,000	122,500	(D)	(D)	(D)	(D)	114,727	125,630
Primary metals.....	33	129,900	(D)	(D)	(D)	131,500	118,600	(S)	(D)	142,200	114,057	137,103
Ferrous metals and products.....	331-32,3398-99	(D)	(D)	(D)	(D)	(D)	(S)	(D)	(D)	(D)	136,026	138,984
Nonferrous metals and products.....	333-36	(D)	112,000	136,400	138,800	(D)	(S)	(D)	(D)	(D)	(S)	(S)
Fabricated metal products.....	34	(S)	111,600	112,900	(S)	76,600	88,100	(S)	(S)	115,500	123,828	157,788
Machinery.....	35	108,400	124,500	142,500	(D)	(D)	(D)	130,000	138,500	147,800	152,797	99,304
Office, computing, and accounting machines.....	357	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	(D)	173,012	96,699
Other machinery, except electrical.....	351-56,358-59	(D)	(D)	(D)	119,200	98,300	99,400	(D)	(D)	(D)	109,868	103,173
Electrical equipment.....	36	114,300	121,700	124,900	120,700	124,300	124,100	132,400	142,800	147,100	150,118	139,675
Radio and TV receiving equipment.....	365	105,300	(D)	(D)	88,700	97,900	124,200	103,400	113,200	(D)	94,017	101,317
Communication equipment.....	366	135,000	143,000	147,800	141,300	155,300	160,300	170,600	177,100	(S)	(S)	(S)
Electronic components.....	367	(S)	100,500	114,100	(D)	98,400	(S)	(S)	128,400	(D)	127,801	153,272
Other electrical equipment.....	361-64,369	(D)	(D)	(D)	(D)	(S)	68,500	(S)	(S)	(D)	160,522	147,014
Transportation equipment.....	37	(D)	(D)	(D)	170,700	183,400	195,600	211,700	215,700	189,400	191,274	201,176
Motor vehicles and motor vehicles equipment.....	371	184,700	211,400	223,100	(D)	(D)	(D)	(D)	(D)	(D)	222,880	243,548
Other transportation equipment.....	373-75,379	114,200	(D)	(D)	(S)	(S)	(D)	(D)	(D)	(D)	(S)	(S)
Aircraft and missiles.....	372,376	143,600	156,000	161,700	149,800	180,400	193,300	207,300	213,700	177,000	180,552	183,400

See explanatory information and SOURCE at end of table.

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Table A-50. Cost per R&D scientist or engineer in R&D-performing companies, by industry and size of company: 1983-93

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Distribution by industry	SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Professional and scientific instruments.....	38	(S)	\$116,900	\$122,000	(S)	(S)	(S)	(S)	(S)	(S)	(S)	(S)
Scientific and mechanical measuring instruments..	381-82	\$83,200	(D)	(D)	(D)	(D)	(S)	(S)	(S)	(S)	(S)	(S)
Optical, surgical, photographic, and other instruments.....	384-87	141,100	(D)	(D)	(D)	(D)	316,700	(S)	(S)	(S)	(S)	159,220
Other manufacturing industries 1/.....	27,31,39	98,500	(D)	(D)	(S)	(D)	(D)	(D)	(D)	(D)	114,049	71,849
Nonmanufacturing industries 2/.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-78, 78-79,80-81, 83-84,87,89	82,400	84,100	94,600	\$86,800	\$69,100	74,900	(S)	(S)	137,400	152,411	161,631
Distribution by size of company: [Number of employees]												
Total.....		\$116,000	\$124,000	\$130,200	\$128,500	\$128,800	\$132,300	\$134,500	\$141,300	\$148,600	\$157,912	\$154,814
Fewer than 500.....		65,700	55,000	(S)	70,600	66,800	67,100	66,200	(S)	103,400	111,358	91,512
500 to 999 3/.....		N/A	87,200	(S)	103,400	92,800	(S)	98,200	(S)	178,700	176,585	89,036
1,000 to 4,999.....		82,800	96,700	97,300	106,400	91,900	100,600	101,900	91,400	119,400	127,135	132,634
5,000 to 9,999.....		93,400	111,000	119,300	108,400	102,900	100,400	102,500	110,800	150,800	148,285	152,854
10,000 to 24,999.....		112,900	130,500	124,600	122,300	132,700	143,000	127,300	135,300	167,300	156,190	178,086
25,000 or more.....		134,200	143,000	155,300	154,300	157,700	160,700	168,200	193,700	180,100	182,839	197,337

1/ Until 1984, tobacco products (SIC 21) was included with "Other manufacturing industries."

2/ Nonmanufacturing industries for 1990 and prior years included the following SICs only: 10-11, 14-17, 40-42, 44-51, 53-54, 56, 60, 62-63, 72-73, 78, 806-07, and 87.

3/ For 1983, data were not broken down into this level of detail. Data are included in "Fewer than 500," above.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
 (S) = Data have been withheld because of imputation of more than 50 percent.
 N/A = Not available

NOTES: The number of full-time-equivalent R&D scientists and engineers used to estimate the cost per R&D scientist or engineer is the arithmetic mean of the numbers of R&D scientists and engineers reported for January in two consecutive years. This number is then divided into the total R&D expenditures of the earlier years, and the ratio is attributed to the earlier year.

Further, as a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

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Table A-51. Cost per R&D scientist or engineer in R&D-performing companies, by industry and size of company: 1993

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Industry	SIC code	Total	Size of company					
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
Total.....		\$154,814	\$91,512	\$89,036	\$132,634	\$152,654	\$178,086	\$197,337
Food, kindred, and tobacco products.....	20,21	135,425	47,819	137,780	96,208	(S)	123,854	183,310
Textiles and apparel.....	22,23	92,696	83,257	180,674	89,805	(D)	(S)	(D)
Lumber, wood products, and furniture.....	24,25	78,050	25,780	88,093	119,254	195,465	(D)	(D)
Paper and allied products.....	26	120,378	162,799	142,901	141,910	174,128	(S)	108,884
Chemicals and allied products.....	28	200,611	126,637	130,922	180,503	163,255	203,871	255,562
Industrial chemicals.....	281-82,286	234,634	(S)	(D)	144,267	145,413	225,376	(D)
Drugs and medicines.....	283	202,129	185,248	227,364	233,409	200,410	(S)	197,069
Other chemicals.....	284-85,287-89	139,731	62,882	(D)	115,397	137,169	186,583	(D)
Petroleum refining and extraction.....	13,29	199,722	69,242	(D)	173,478	(D)	217,135	211,290
Rubber products.....	30	99,391	42,996	172,908	137,498	(S)	(D)	(D)
Stone, clay, and glass products.....	32	125,630	95,980	(D)	121,338	(D)	(S)	(D)
Primary metals.....	33	137,103	(D)	120,222	104,840	196,718	148,596	(D)
Ferrous metals and products.....	331-32,3398-99	138,984	132,094	107,768	95,513	(D)	(D)	(D)
Nonferrous metals and products.....	333-36	(S)	(D)	129,323	122,737	(D)	(D)	(D)
Fabricated metal products.....	34	157,788	103,249	112,462	109,313	(D)	(S)	(D)
Machinery.....	35	99,304	(D)	133,019	128,257	170,379	172,712	(D)
Office, computing, and accounting machines.....	357	96,699	(D)	159,055	143,883	(S)	(D)	(D)
Other machinery, except electrical.....	351-56,358-59	103,173	55,430	113,324	111,124	104,861	(D)	(D)
Electrical equipment.....	36	139,675	71,677	124,723	130,555	175,288	163,531	171,255
Radio and TV receiving equipment.....	365	101,317	78,088	(D)	(D)	0	0	0
Communication equipment.....	366	(S)	58,055	132,318	125,388	0	(D)	(D)
Electronic components.....	367	153,272	84,027	125,463	(D)	(D)	(D)	(D)
Other electrical equipment.....	361-84,369	147,014	55,204	(D)	143,171	(D)	(S)	(D)
Transportation equipment.....	37	201,176	(D)	171,702	125,118	(S)	229,400	(D)
Motor vehicles and motor vehicles equipment.....	371	243,548	48,348	(S)	138,515	(S)	(D)	(D)
Other transportation equipment.....	373-75,379	(S)	(D)	(D)	119,544	(D)	(D)	0
Aircraft and missiles.....	372,376	183,400	(S)	(D)	(S)	(D)	230,124	194,088

See explanatory information and SOURCE at end of table.

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Table A-51. Cost per R&D scientist or engineer in R&D-performing companies, by industry and size of company: 1993

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Industry	SIC code	Total	Size of company					
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
Professional and scientific instruments.....	38	(S)	\$57,063	\$108,858	\$119,933	(S)	(S)	(S)
Scientific and mechanical measuring instruments.....	381-82	(S)	65,796	117,468	(S)	(D)	(D)	(S)
Optical, surgical, photographic, and other instruments.....	384-87	159,220	50,779	102,716	138,385	(D)	(D)	(S)
Other manufacturing industries.....	27,31,39	71,849	31,525	108,920	100,499	(D)	(S)	(D)
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,80-85,87, 701,73,75-78, 78-79,80-81, 83-84,87,89	161,631	152,323	49,120	121,356	(S)	124,464	229,216

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The number of full-time-equivalent R&D scientists and engineers used to estimate the cost per R&D scientist or engineer is the arithmetic mean of the numbers of R&D scientists and engineers reported for January in two consecutive years. This number is then divided into the total R&D expenditures of the earlier years, and the ratio is attributed to the earlier year.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-52. Cost per R&D scientist or engineer in R&D-performing companies ranked by size of R&D program: 1983-93

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Companies ranked by size of R&D program (based on total R&D funds)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
First 4.....	\$185,200	\$202,000	\$225,800	\$225,900	\$222,600	\$226,200	\$218,100	\$219,600	\$213,200	\$202,492	\$252,629
Next 4.....	154,000	167,000	176,200	171,400	196,900	210,700	225,800	249,000	223,700	238,950	199,559
Next 12.....	119,300	127,800	132,500	131,200	141,600	153,000	148,700	129,100	159,900	170,276	199,118
Next 20.....	117,800	121,000	144,000	125,600	146,300	154,500	132,500	145,800	(S)	(S)	(S)
Next 60.....	118,800	130,400	124,100	139,000	128,700	141,300	145,400	164,200	170,500	181,760	193,925
Next 100.....	96,300	108,900	122,800	146,700	128,600	137,300	141,900	137,000	169,000	173,101	138,227
Next 200.....	86,400	97,300	94,100	138,000	110,800	124,500	106,100	120,200	121,000	126,545	140,292
Average of above 400 R&D performing companies.....	125,400	139,000	144,400	160,400	153,100	160,600	161,500	161,200	169,000	158,098	154,814

KEY: (S) = Data have been withheld because of imputation of more than 50 percent.

NOTES: The number of full-time-equivalent R&D scientists and engineers used to estimate the cost per R&D scientist or engineer is the arithmetic mean of the numbers of R&D scientists and engineers reported for January in two consecutive years. This number is then divided into the total R&D expenditures of the earlier years, and the ratio is attributed to the earlier year.

Further, as a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

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Table A-53. Domestic employment of R&D-performing companies, by industry and size of company: 1992-93

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Industry	SIC code	Total	Size of company					
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
			[In thousands]					
			1992					
Total.....		16,094	1,734	580	2,421	1,573	2,879	6,927
Food, kindred, and tobacco products.....	20,21	1,026	54	28	148	142	187	467
Textiles and apparel.....	22,23	402	17	21	112	40	(D)	(D)
Lumber, wood products, and furniture.....	24,25	270	39	16	76	43	(D)	(D)
Paper and allied products.....	26	557	14	34	57	47	169	236
Chemicals and allied products.....	28	1,118	131	34	176	130	371	276
Industrial chemicals.....	281-82,286	431	9	11	69	57	136	149
Drugs and medicines.....	283	366	69	(D)	42	24	170	(D)
Other chemicals.....	284-85,287-89	321	53	(D)	65	49	65	(D)
Petroleum refining and extraction.....	13,29	407	9	3	24	22	101	248
Rubber products.....	30	393	120	(D)	109	27	39	(D)
Stone, clay, and glass products.....	32	227	25	(D)	36	29	93	(D)
Primary metals.....	33	433	36	(D)	108	87	108	(D)
Ferrous metals and products.....	331-32,3398-99	233	12	(D)	71	51	47	(D)
Nonferrous metals and products.....	333-36	200	24	(D)	37	36	61	(D)
Fabricated metal products.....	34	477	66	42	140	68	161	0
Machinery.....	35	1,320	247	74	263	146	121	469
Office, computing, and accounting machines.....	357	473	13	(D)	54	76	(D)	309
Other machinery, except electrical.....	351-56,358-59	847	234	(D)	209	70	(D)	180
Electrical equipment.....	36	1,362	180	59	234	80	214	595
Radio and TV receiving equipment.....	365	36	7	(D)	8	0	(D)	0
Communication equipment.....	366	362	36	(D)	41	0	(D)	(D)
Electronic components.....	367	313	80	21	91	49	(D)	(D)
Other electrical equipment.....	361-64,369	651	57	27	94	31	117	325
Transportation equipment.....	37	1,953	22	22	88	122	192	1,507
Motor vehicles and motor vehicles equipment.....	371	890	2	6	50	(D)	(D)	(D)
Other transportation equipment.....	373-75,379	97	8	7	6	(D)	(D)	(D)
Aircraft and missiles.....	372,376	966	12	9	32	29	125	759
Professional and scientific instruments.....	38	748	129	49	141	53	58	318
Scientific and mechanical measuring instruments.....	381-82	395	73	(D)	73	26	(D)	167
Optical, surgical, photographic, and other instruments.....	384-87	353	56	(D)	68	27	(D)	151
Other manufacturing industries.....	27,31,39	420	88	19	98	52	82	81
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	4,981	557	107	611	485	799	2,422

See explanatory information and SOURCE at end of table.

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Table A-53. Domestic employment of R&D-performing companies, by industry and size of company: 1992-93

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Industry	SIC code	Total	Size of company					
			Fewer than 500 employees	500 to 999 employees	1,000 to 4,999 employees	5,000 to 9,999 employees	10,000 to 24,999 employees	25,000 or more employees
			[In thousands]					
1993								
Total		16,370	1,771	617	2,628	1,678	2,853	6,823
Food, kindred, and tobacco products	20,21	1,067	70	39	171	155	147	485
Textiles and apparel	22,23	473	48	(D)	127	66	132	(D)
Lumber, wood products, and furniture	24,25	311	53	27	75	55	(D)	(D)
Paper and allied products	26	572	38	23	73	48	159	231
Chemicals and allied products	28	1,191	104	40	183	135	342	387
Industrial chemicals	281-82,286	510	13	11	61	59	129	234
Drugs and medicines	283	349	23	8	64	25	(D)	(D)
Other chemicals	284-85,287-89	332	68	21	55	51	(S)	(D)
Petroleum refining and extraction	13,29	377	8	3	36	21	106	203
Rubber products	30	377	101	40	101	48	(D)	(D)
Stone, clay, and glass products	32	251	33	(D)	48	31	91	(D)
Primary metals	33	447	38	(D)	113	95	109	(D)
Ferrous metals and products	331-32,3398-99	279	19	(D)	83	76	48	(D)
Nonferrous metals and products	333-36	168	19	(D)	30	19	61	(D)
Fabricated metal products	34	630	115	45	162	(D)	205	(D)
Machinery	35	1,137	238	88	278	173	147	213
Office, computing, and accounting machines	357	273	33	14	61	64	(D)	(D)
Other machinery, except electrical	351-56,358-59	864	205	74	217	109	(D)	(D)
Electrical equipment	36	1,224	151	63	237	56	160	557
Radio and TV receiving equipment	365	16	(D)	(D)	10	0	0	0
Communication equipment	366	213	(D)	10	45	0	(D)	(D)
Electronic components	367	328	55	23	83	(D)	(D)	(D)
Other electrical equipment	361-64,369	867	57	(D)	99	(D)	100	369
Transportation equipment	37	1,787	45	31	123	140	154	1,294
Motor vehicles and motor vehicles equipment	371	945	24	(D)	81	66	(D)	608
Other transportation equipment	373-75,379	72	13	(D)	10	30	(D)	0
Aircraft and missiles	372,376	770	8	18	32	44	72	586
Professional and scientific instruments	38	764	104	49	138	41	75	357
Scientific and mechanical measuring instruments	381-82	414	51	27	58	(D)	(D)	206
Optical, surgical, photographic, and other instruments	384-87	350	53	22	80	(D)	(D)	151
Other manufacturing industries	27,31,39	491	113	(D)	92	81	120	(D)
Nonmanufacturing industries	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	5,271	512	91	671	504	869	2,624

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld to avoid disclosing operations of individual companies.

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

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Table A-54. R&D scientists and engineers per 1,000 employees in manufacturing companies, by industry and size of company: 1983-93

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Industry and size of company	SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Distribution by industry:												
Total.....		34	40	43	45	45	46	46	47	50	51	52
Food, kindred, and tobacco products 1/.....	20,21	6	7	8	7	7	8	8	8	9	9	9
Textiles and apparel.....	22,23	4	5	5	4	4	(S)	(S)	6	7	8	7
Lumber, wood products, and furniture.....	24,25	(S)	6	6	5	5	5	5	6	5	6	16
Paper and allied products.....	26	12	13	13	11	11	11	13	16	17	19	19
Chemicals and allied products.....	28	54	57	57	70	68	69	69	69	69	71	80
Industrial chemicals.....	281-82,286	45	41	39	56	52	54	56	59	60	61	58
Drugs and medicines.....	283	(S)	89	81	98	98	94	92	96	95	116	138
Other chemicals.....	284-85,287-89	39	51	62	63	61	60	60	53	53	43	51
Petroleum refining and extraction.....	13,29	22	22	21	19	20	24	26	26	26	27	27
Rubber products.....	30	(S)	27	26	25	19	(S)	26	32	38	33	24
Stone, clay, and glass products.....	32	16	17	20	20	24	26	26	24	24	23	21
Primary metals.....	33	11	12	12	11	12	12	12	11	11	11	11
Ferrous metals and products.....	331-32,3398-99	11	11	11	7	9	9	8	7	7	7	9
Nonferrous metals and products.....	333-36	13	16	16	17	16	17	16	15	(S)	(S)	15
Fabricated metal products.....	34	(S)	(S)	(S)	(S)	17	17	(S)	20	19	16	21
Machinery.....	35	57	56	60	64	67	66	71	73	74	74	61
Office, computing, and accounting machines.....	357	88	90	99	107	115	114	126	131	137	139	124
Other machinery, except electrical.....	351-56,358-59	30	32	29	26	29	29	31	33	36	37	41
Electrical equipment.....	36	51	49	53	59	65	71	68	66	67	65	75
Radio and TV receiving equipment.....	365	(S)	(S)	23	55	45	45	44	30	30	28	51
Communication equipment.....	366	61	56	62	68	73	94	96	89	91	(S)	(S)
Electronic components.....	367	(S)	(S)	81	82	86	100	96	89	95	92	122
Other electrical equipment.....	361-64,369	(S)	30	30	26	28	26	30	38	43	44	31
Transportation equipment.....	37	N/A	(S)	71	69	68	72	71	68	73	76	70
Motor vehicles and motor vehicles equipment.....	371	30	27	28	38	42	41	41	43	49	51	54
Other transportation equipment.....	373-75,379	(S)	(S)	8	23	38	40	52	45	(S)	(S)	(S)
Aircraft and missiles.....	372,376	102	110	116	99	91	103	101	96	98	101	94

See explanatory information and SOURCE at end of table.

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Table A-54. R&D scientists and engineers per 1,000 employees in manufacturing companies, by industry and size of company: 1983-93

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Industry and size of company	SIC code	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Distribution by industry:												
Professional and scientific instruments.....	38	(S)	(S)	(S)	(S)	71	62	59	71	(S)	(S)	(S)
Scientific and mechanical measuring instruments.....	381-82	(S)	(S)	(S)	(S)	85	84	96	95	(S)	(S)	(S)
Optical, surgical, photographic, and other instruments.....	383-87	(S)	(S)	70	61	63	48	28	17	(S)	59	98
Other manufacturing industries 1/.....	27,31,39	(S)	(S)	(S)	(S)	18	17	14	14	14	14	32
Distribution by size of company: (Number of employees)												
Total.....		34	40	43	45	45	46	46	47	50	51	52
Fewer than 500.....		34	42	50	59	59	50	50	51	56	53	77
500 to 999 2/.....		N/A	21	21	23	27	29	29	28	32	39	37
1,000 to 4,999.....		25	24	26	32	30	26	29	32	34	41	39
5,000 to 9,999.....		22	19	19	28	29	33	35	37	38	38	35
10,000 to 24,999.....		26	29	30	33	32	33	35	35	36	42	37
25,000 or more.....		42	47	49	56	57	59	61	61	66	63	63

1/ Until 1984, tobacco products (SIC 21) was included with "other manufacturing industries."

2/ For 1983, data were not broken down into this level of detail. Data are included in "Fewer than 500," above.

KEY: (S) - Data have been withheld because of imputation of more than 50 percent.
N/A - Not available

NOTES: The number of R&D scientists and engineers per 1,000 employees for 1983 is derived by dividing the arithmetic mean of scientists and engineers employed in January 1982 and January 1983 by the number of employees in all activities in March 1982. Similar procedures were used for earlier years. Nonmanufacturing industries are included in pre-1983 calculations.

Further, as a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

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Table A-55. R&D funds per employee in R&D-performing companies, by size of company: 1983-93

Page 1 of 1

Size of company [Number of employees]	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Total (company, Federal, and other) R&D funds per employee											
Total.....	\$4,163	\$4,579	\$5,148	\$5,153	\$5,338	\$5,594	\$5,920	\$6,291	\$6,842	\$7,366	\$7,225
Fewer than 500	2,186	2,767	3,028	5,414	5,553	5,377	5,660	6,339	7,279	7,493	9,718
500 to 999 1/.....	N/A	2,158	2,238	3,229	3,121	2,906	3,197	3,826	(W)	14,206	5,184
1,000 to 4,999.....	2,042	2,480	2,725	3,261	3,395	3,223	3,404	3,738	4,243	4,907	5,046
5,000 to 9,999.....	2,194	2,505	2,851	2,849	3,210	3,992	4,158	4,456	4,706	5,253	5,379
10,000 to 24,999.....	2,966	3,385	3,500	3,334	3,668	3,713	3,607	4,401	5,223	5,468	5,294
25,000 or more.....	5,785	6,184	7,071	6,878	7,035	7,388	7,863	8,005	8,252	8,908	9,123
Company and other (except Federal) R&D funds per employee											
Total.....	\$2,814	\$3,095	\$3,383	\$3,503	\$3,562	\$3,844	\$3,607	\$4,401	\$5,322	\$5,839	\$5,834
Fewer than 500	1,749	2,212	2,407	4,750	4,811	4,782	5,201	5,701	6,242	6,384	7,828
500 to 999 1/.....	N/A	1,782	1,700	2,997	2,859	2,677	3,029	3,598	(W)	13,937	4,871
1,000 to 4,999.....	1,687	2,096	2,316	2,725	2,799	2,761	2,990	3,346	3,817	4,488	4,623
5,000 to 9,999.....	1,613	2,199	2,409	2,316	2,682	3,335	3,624	4,286	4,228	4,764	4,935
10,000 to 24,999.....	2,351	2,689	2,769	2,697	2,969	3,163	3,217	3,863	4,106	4,282	4,400
25,000 or more.....	3,637	3,792	4,208	4,077	4,010	4,402	5,016	5,251	5,739	6,404	6,691

1/ For 1983, data were not broken down into this level of detail. Data are included in "Fewer than 500," above.

KEY: N/A = Not available
(W) = Data have been withheld pending further review.

NOTES: Averages were derived by dividing total and company R&D funds for a calendar year by employment data for March of that year.

Further, as a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-56. Concentration of total employment in R&D-performing companies ranked by size of R&D program: 1987-93

Page 1 of 1

Companies by size of R&D program	1987	1988	1989	1990	1991	1992	1993
[Percent]							
First 4 (1-4).....	7	7	7	7	7	7	6
Next 4 (5-8).....	4	3	3	3	3	3	2
Next 12 (9-20).....	6	6	6	5	5	5	5
Next 20 (21-40).....	6	5	4	5	4	4	4
Next 60 (41-100).....	8	9	10	9	9	8	8
Next 100 (101-200).....	7	8	8	8	10	9	9
Next 200 (201-400).....	9	9	9	11	10	10	10
All others.....	53	53	53	52	52	47	55

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. See the technical notes for more information.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table A-57. Company-financed R&D performed outside the United States by U.S. domestic companies and their foreign subsidiaries, by country: 1993

Page 1 of 1

Location of foreign subsidiary	Number of companies	Total expenditures [In millions of dollars]
Distribution by country:		
Total 1/.....	643	9,781
Canada.....	111	429
Germany.....	92	1,459
France.....	85	816
Japan.....	79	639
United Kingdom.....	156	1,186
Other countries.....	327	1,448
Undistributed 2/.....	375	3,804
Distribution by companies with R&D expenditures in one or more countries:		
Total.....	643	9,781
One country.....	144	517
Two countries.....	57	289
Three countries.....	26	137
Four countries.....	14	126
Five countries.....	15	280
More than five countries.....	12	1,127
Undistributed 2/.....	375	7,305 3/

1/ Frequencies do not add to total because categories are not mutually exclusive.

2/ Includes data reported on Form RD-1L that were not allocated to a specific country, and total foreign R&D reported on Form RD-1A. Form RD-1A does not collect data by country.

3/ To avoid double counting, if a company reported ANY foreign R&D expenditures that were not allocated to specific countries, ALL foreign R&D expenditures, including those that may have been allocated to specific countries, are included in this cell. For example, if a company allocated a portion of its foreign R&D expenditures to Canada and left the remainder unallocated, ALL of its foreign R&D is included in this cell because it could not be determined during processing how many other countries were sites of R&D performance.

NOTE: Data are reported in current U.S. dollars.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

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INTRODUCTION

This report is the second of two publications produced from the 1993 Survey of Industrial Research and Development. The first, a Data Brief announcing the availability of survey results, contains analytical information and highlights the increasing share of R&D performed by nonmanufacturing industries. This report, the Detailed Statistical Tables report, contains the full set of statistics produced from the survey. Both publications provide statistics on research and development (R&D) funding for the years 1983-93 and on R&D personnel for the period from January 1984 to January 1994.

This report provides national estimates of the expenditures on R&D performed within the United States by industrial firms, whether U.S. or foreign owned. Among the statistics are estimates of total R&D, the portion of the total financed by U.S. Government funds, and the portion financed by the companies themselves (or by other non-Federal sources such as State and local governments or other industrial firms under contracts or subcontracts). Total R&D is also separated into its character-of-work components: basic research, applied research, and development. Other R&D statistics include those of the funds for R&D financed by a domestic firm but performed outside the United States, R&D contracted to organizations outside of firm, and the funds spent to perform energy-related R&D. This report also provides statistics on R&D-performing companies, including domestic net sales, number of employees, number of R&D-performing scientists and engineers, and cost per R&D scientist and engineer.

The Survey of Industrial Research and Development is a sample survey that intends to include or represent all for-profit, nonfarm R&D-performing companies, either publicly or privately held. The survey's primary focus is on U.S. industry as a performer of, rather than as a source of funds for, R&D. Thus, data on Federal support of R&D activities performed by industry are collected and resulting statistics appear in several tables, but statistics on industrial funding of R&D undertaken at universities and colleges and

other nonprofit organizations are not collected and therefore are not included in the tables.¹

Industry statistics are developed from data collected from individual companies or enterprises. Since the survey is enterprise based rather than establishment based, all data collected for the various subparts of each enterprise (plants, divisions, or subdivisions) are tabulated in the major standard industrial classification (SIC) of the company. The resulting industry estimates are reported using the SIC of the companies within each industry. National totals are estimated by summing the industry estimates.

All companies that spend more than \$1 million annually on R&D in the United States or have 1,000 or more employees receive a survey questionnaire every year. Remaining firms are subjected to probability sampling and may or may not receive a questionnaire for a given survey year. Among the organizations purposely excluded from the survey are trade associations and not-for-profit consortia. Although their primary mission is to serve industry, these associations are established as nonprofit organizations.

Respondents receive detailed definitions to help them determine which expenses to include or exclude from the R&D data they provide. Nevertheless, the statistics presented in this report are subject to response and concept errors caused by different respondent interpretations of the definitions of R&D activities and by variations in company accounting procedures. Consequently, the statistics are better indicators of changes in, rather than absolute levels of, R&D spending and personnel.

¹ Data on R&D performed at universities and colleges are collected in the annual Survey of Scientific and Engineering Expenditures at Universities and Colleges. Resumption of a survey of other nonprofit organizations, discontinued in the mid-1970s, is planned. More information about these surveys is available from NSF's Research and Development Statistics Program in the Division of Science Resources Studies at the address given in General Notes, preceding section A.

The National Science Foundation (NSF) has sponsored a survey of industrial R&D since 1953. The two surveys covering the 1953-56 period were conducted by the Bureau of Labor Statistics (BLS), U.S. Department of Labor.² Since 1957, the Bureau of the Census has conducted the survey.³ NSF's Division of Science Resources Studies sponsors and monitors the survey.

The content of the survey has been expanded and refined over the years in response to an increasing need by policymakers for more detailed information on the Nation's R&D effort. For example, questions on energy R&D were added in the early seventies, following the first oil-shortage crisis. On the other hand, the frequency of collection of certain data items has been reduced in recent years in an attempt to alleviate some of the respondent burden that has been placed on industry from all sources. For large firms known to perform R&D, a detailed questionnaire, Form RD-1L, is used to collect data for odd-numbered years and an abbreviated version, Form RD-1S, is used to collect data for even-numbered years. To further limit reporting burden on small R&D performers and on firms that are included in the sample for the first time, an even more abbreviated form, Form

RD-1A, which collects only the most crucial data, is used each year. This report provides data collected from the Forms RD-1L and RD-1A.

Several changes have been made to the survey recently that are of special importance to users of this report. Prior to the 1992 survey, statistics were based on samples selected at irregular intervals (i.e., 1967, 1971, 1976, 1981, 1987). In intervening years a subset of the last sample (called a panel) was used. The most recent sample prior to the 1992 survey was selected and first used for survey year 1987. Estimates for 1988 through 1991 were based on surveys of the panel of companies that reported R&D activity in the 1987 survey. Beginning with the 1992 survey, statistics are based on samples selected annually. Also, beginning with the 1992 survey, the sample size was increased from approximately 14,000 to nearly 23,400 firms. This increase was made for several reasons: (1) to account better for births of R&D-performing establishments in the survey universe, (2) to survey more fully and accurately R&D performed by nonmanufacturing firms (especially in the service sector and by small firms in all industries), and (3) to gather more current information about potential R&D performers.

² See National Science Foundation, *Science and Engineering in American Industry: Final Report on a 1953-54 Survey* (NSF 56-16) and *Science and Engineering in American Industry: 1956* (NSF 59-50) (Washington, DC: Supt. of Documents, GPO, 1956 and 1960).

³ Data obtained in the earlier BLS surveys are not directly comparable with Census figures because of methodological and other differences.

SURVEY METHODOLOGY⁴

REPORTING UNIT

The reporting unit for the Survey of Industrial Research and Development is the enterprise, or company, defined as a business organization of one or more establishments under common ownership or control. The survey includes two groups of enterprises: (1) companies known to conduct R&D and (2) a sample representation of companies for which information on the extent of R&D activity is uncertain.

FRAME CREATION

The Standard Statistical Establishment List (SSEL), a Bureau of the Census compilation that contains information on more than 3 million establishments with paid employees, was the universe from which the frame used to select the 1993 survey sample was created (see table B-1 for universe and sample sizes). For companies with more than one establishment, data were summed to the company level. The firm was then assigned a single standard industrial classification (SIC) code based on the activity of the establishment(s) having the highest dollar value of payroll. This assignment was done on a hierarchical basis. The enterprise was first assigned to the economic division (manufacturing or nonmanufacturing) with the highest payroll, then to the two-digit SIC code with the highest payroll within the assigned division, then to the three-digit SIC code with the highest payroll within the assigned two-digit industry.

The frame from which the survey sample was drawn included all for-profit companies classified in nonfarm industries. For surveys prior to 1992, the frame was limited to companies above certain size criteria based on number of employees.⁵ These criteria varied by industry. Also, some industries

were excluded from the frame because it was believed that these industries contributed little or no R&D activity to the final survey estimates. For the 1992 sample, new industries were added to the frame⁶ and the size criteria were lowered considerably and applied uniformly to firms in all industries. As a result, nearly 2 million enterprises with five or more employees were given a chance of selection. For comparison, the frame for the 1987 sample included 154,000 companies of specified sizes and industries. The frame used to select the 1993 sample is comparable with the 1992 frame.

External information about the likelihood that a company conducted R&D was used to identify nearly 10,000 companies that were included in the survey sample with certainty. Sources included the 1992 survey, directories that include company information on R&D reported to the Securities and Exchange Commission, commercially available directories of R&D performing companies, Department of Defense directories of contracts awarded for R&D, and various publications and newsletters that highlight firms conducting R&D. In addition, all companies in the frame with 1,000 employees or more were selected with certainty.

SAMPLE SELECTION

Probability Proportionate to Size

As with most types of economic surveys, the sample was selected using probabilities proportionate to size. That is, large companies had a higher probability of selection than did small companies. For this survey, it would have been ideal if company size could have been determined by the amount of R&D expenditures. Unfortunately, except for the companies that were in a previous survey or for which there was information from external sources, it was impossible to know the R&D expenditure values for firms in the universe. Consequently, most companies' R&D expenditures had to be estimated, with the probability of selection based on those estimated values.

Since total employment was known for each company in the universe, it was possible to use an already-

⁴ Information for this section was provided by the Manufacturing and Construction Division of the Bureau of the Census, the collecting and compiling agent for the National Science Foundation. Copies of the technical papers cited can be obtained by contacting NSF's Research and Development Statistics Program in the Division of Science Resources Studies at the address given in General Notes, preceding section A.

⁵ See the Bureau of the Census technical memorandum entitled *Evaluation of Total Employment Cut-Offs in the Survey of Industrial Research and Development*, Nov. 3, 1994.

⁶ These industries are listed and discussed under Comparability of Statistics, later in this section.

Table B-1: Number of companies in the universe and selected for the sample: 1993

Page 1 of 2

Industry	SIC code	Companies in universe	1993 Survey			Companies reporting R&D expenditures for 1993 3/		Companies reporting zero R&D expenditures for 1993
			Companies selected for 1993 sample	Noncertainties 1/	Certainties 2/	Greater than or equal to \$1 million	Less than \$1 million	
Total.....		1,797,290	24,064	11,838	12,226	2,792	3,637	13,426
MANUFACTURING								
Total.....		196,736	15,105	8,090	7,015	2,118	3,111	7,164
Distribution by industry:								
Food, kindred, and tobacco products.....	20,21	10,308	627	268	359	80	165	286
Textiles and apparel.....	22,23	16,685	1,084	532	552	54	116	649
Lumber, wood products, and furniture.....	24,25	22,989	1,795	1,255	540	26	207	1,210
Paper and allied products.....	26	3,239	409	248	161	51	55	244
Chemicals and allied products.....	28	5,237	583	150	433	255	186	91
Industrial chemicals.....	281-82,286	902	116	22	94	75	13	16
Drugs and medicines.....	283	795	133	10	123	89	26	11
Other chemicals.....	284-85,287-89	3,540	334	118	216	91	147	64
Oil and Gas Extraction.....	13	5,734	149	73	76	12	13	102
Petroleum refining and related industries.....	29	640	132	33	99	19	36	55
Rubber products.....	30	8,564	503	223	280	91	143	191
Stone, clay, and glass products.....	32	7,328	817	561	256	39	128	486
Primary metals.....	33	3,869	793	431	362	61	140	478
Ferrous metals and products.....	331-32,3398-99	2,022	346	192	154	30	74	195
Nonferrous metals and products.....	333-36	1,847	447	239	208	31	66	283
Fabricated metal products.....	34	21,381	1,916	1,458	458	112	350	1,084
Machinery.....	35	30,482	1,888	937	951	425	577	580
Office, computing, and accounting machines.....	357	1,248	413	205	208	166	78	66
Other machinery, except electrical.....	351-56,358-59	29,234	1,475	732	743	259	499	514
Electrical equipment.....	36	9,263	1,640	690	950	403	477	449
Radio and TV receiving equipment.....	365	407	111	62	49	10	25	53
Communication equipment.....	366	1,028	344	115	229	121	120	39
Electronic components.....	367	3,776	388	108	280	143	101	84
Other electrical equipment.....	361-64,369	4,052	797	405	392	129	231	273
Transportation equipment.....	37	5,724	546	255	291	100	124	217
Motor vehicles and motor vehicles equipment.....	371	2,602	123	23	100	45	32	30
Other transportation equipment.....	373-75,379	2,077	354	225	129	16	79	178
Aircraft and missiles.....	372,376	1,045	69	7	62	39	13	9

See explanatory information and SOURCE at end of table.

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Table B-1: Number of companies in the universe and selected for the sample: 1993

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Industry	SIC code	Companies in universe	1993 Survey			Companies reporting R&D expenditures for 1993 3/		Companies reporting zero R&D expenditures for 1993
			Companies selected for 1993 sample	Noncertainties 1/	Certainties 2/	Greater than or equal to \$1 million	Less than \$1 million	
Professional and scientific instruments.....	38	5,905	767	161	606	319	212	117
Scientific and mechanical measuring instruments.....	381-82	2,937	347	46	301	169	113	27
Optical, surgical, photographic, and other instruments.....	384-87	2,968	420	115	305	150	99	90
Other manufacturing industries.....	27,31,39	39,408	1,456	815	641	71	182	925
NONMANUFACTURING								
Total.....		1,600,554	8,959	3,748	5,211	674	526	6,282
Communication services.....	48	7,680	71	6	65	18	5	36
Electric, gas, and sanitary services.....	49	3,280	175	11	164	45	52	60
Computer programming, data processing, other computer-related engineering, architectural, and surveying services.....	737,871	35,115	684	300	384	177	87	314
Hospitals and medical and dental laboratories.....	806-07	5,809	630	220	410	18	19	500
Research, development, and testing services.....	873	4,694	181	7	174	115	22	26
Other nonmanufacturing industries.....	07-10,12-17, 40-42,44-47, 50-59,60-65, 67,701,73 (except 737),75-76, 78-79,80-81, (except 806 and 807),83-84,87 (except 871 and 873),89	1,543,996	7,218	3,204	4,014	301	341	5,326

1/ Noncertainties were companies for which probability of selection was less than one.

2/ Certainties were companies for which probability of selection was one. This included companies for which 1992 R&D expenditures were equal to or greater than \$1 million, or 1992 employment was equal to or greater than 1,000, or were selected in order to provide estimates of sufficient accuracy.

3/ This included RD-1L companies for which total R&D expenditure data were imputed.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

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observed relationship between employment and R&D to estimate R&D expenditure values for companies in the frame. This was the same strategy employed in the 1981 and 1987 sampling operations. For 1993 sampling, data collected in the 1992 survey were used to derive this relationship separately for single-unit companies and multiestablishment companies. The effect in all cases was to give firms with a large number of employees higher probability of selection since it was assumed that large companies were more likely to perform R&D and that the amount of R&D was proportionate to the size of the company.

Sample Stratification and Relative Standard Error Constraints

Even though the particular sample selected was one of a large number of the same type and size that by chance might have been selected, statistics resulting from the different samples would differ somewhat from each other. These differences are represented by estimates of sampling error—the smaller the sampling error, the more precise the statistic.

As a control of sampling error in the statistics resulting from this survey, parameters were specified to allocate the sample across various levels, or strata, that corresponded to industry groupings. These parameters permitted the sample size to be varied to achieve a desired level of sampling error for each stratum and were assigned so that estimated errors of total R&D for industries in these strata did not exceed certain levels. Sample sizes among the strata were only constrained by the limit placed on the total sample size dictated by the available budget.

For sample selections prior to 1992, the strata designations were the published industry categories. The sample was allocated across these industry categories to provide high, medium, and low levels of precision. For the 1992 sample, the criteria for this allocation were modified. For gathering information to review and evaluate the appropriateness of the published industry groupings, the allocation of the sample was controlled for levels of industry detail below those traditionally published. The result was that the frame was partitioned into 95 manufacturing industry strata and 25 nonmanufacturing strata. This stratification was used for the 1993 sample.

Each industry was allocated to one of three groups. The first group was formulated to analyze the distribution of data in manufacturing industries. In this group, each three-digit manufacturing industry was considered a separate stratum. The second group was formulated to improve coverage and to identify emerging industries. In this group, selected two-digit and three-digit nonmanufacturing industries each were considered a separate stratum. The industries were identified as those for which statistics had been published previously and those with high concentrations of scientists and engineers as reported in occupational surveys. The third group was a large stratum of companies in nonmanufacturing industries that had not been included in previous sampling frames or for which there was little indication of R&D activity.

Once the strata were defined, the following criteria were used to achieve the target sampling error for total R&D:

- Sampling error not to exceed 2 percent for 44 three-digit manufacturing industries that contribute to a current publication level below the two-digit industry level and for 15 three-digit nonmanufacturing industries that represent a current publication level or for which there is a high concentration of scientists or engineers.
- Sampling error not to exceed 5 percent for 51 three-digit manufacturing industries that are part of currently published two-digit or aggregations of two-digit industries; 9 two-digit nonmanufacturing industries for which R&D activity was likely, and 1 stratum of remaining nonmanufacturing industries for which there was little prior indication of R&D activity.

Based on the desired precision represented by these sampling error estimates, the criteria suggested a total sample size of approximately 23,000.

A limitation of the sample allocation process should be noted. Sampling errors were controlled by using a universe total that, in large part, was improvised. That is, as previously noted, an R&D value was assigned to every company in the frame, even

though many of these companies actually may not have had R&D expenditures. The value assigned was imputed for the majority of companies in the frame, and, as a consequence, the estimated universe and the distribution of individual company values did not necessarily reflect the true distribution. Estimates of sampling variability were nevertheless based on this distribution. The presumption was—and this had been confirmed using the previous sample selection—that actual variation in the sample design would be less than that estimated, because many of the sampled companies have true R&D values of zero, not the widely varying values that were imputed using total employment as a predictor of R&D. Thus, the 2-percent and 5-percent error levels described earlier are conservative. (See table B-2 for a list by industry of the actual standard error estimates for selected items.)

In addition to sampling error, the estimates are subject to nonsampling error. Errors are grouped into five categories: specification, coverage, response, nonresponse, and processing. For detailed discussions on the sources, control, and measurement of each of these types of error, see the technical reports.⁷

Sample Size and Weighting

The sample was selected with a target sample size of 23,000 and with other parameters set to ensure compliance with the standard error constraints. An actual sample of 24,064 was selected. The actual sample size differed from the target for two reasons. First, the sample frame was subjected to independent sampling. Each company in the frame had an independent chance of selection based on its assigned probability; i.e., selection of a company was completely independent of the selection of any other company. In independent sampling, sample size itself is a random variable. Theoretically, a sample of size zero or a sample the size of the entire universe is possible, but the probabilities of these extremes are so small that these are nearly impossible situations. The actual sample size is usually quite close to the specified size. If there is too much deviation, the selection is simply executed again.

Second, a minimum probability rule was imposed. As noted earlier, probabilities of selection proportionate to size are assigned to each company, where size is the imputed R&D value assigned each company. Selected companies that report actual R&D expenditures vastly larger than their assigned values can have adverse effects on the statistics, which are based on the weighted value of survey responses.⁸ So that the effects on the final statistics would be lessened, the maximum weight a company could assume was arbitrarily controlled by specifying the probability of the company's selection. If the probability, based on company size, was less than the arbitrarily set minimum, then the probability was set equal to the minimum value. The consequence of raising these original probabilities to the minimum probability was to raise the expected sample size. It is likely that most of the difference between the size of the target sample and the actually selected sample was because of this rule.

Third, between the time that the frame was created and the survey was prepared for mailing, the operational status of some companies changed—that is, they were merged with or acquired by another company, or they were no longer in business. Before preparation of the survey for mailing, the operational status is updated to identify these changes. As a result, the number of companies mailed a survey form is somewhat smaller than the number of companies initially selected for the survey.

SURVEY QUESTIONNAIRES

Two questionnaires are used each year to collect data for the survey. For large firms known to perform R&D, a detailed questionnaire, Form RD-1L, is used to collect data for odd-numbered years and an abbreviated version, Form RD-1S, is used to collect data for even-numbered years. The questionnaires are cycled in this manner to reduce reporting burden on survey respondents.

The Form RD-1L requests data on sales or receipts, total employment, employment of scientists and engineers, expenditures for R&D performed within the company with Federal funds and with company and

⁷ U.S. Department of Commerce, Bureau of the Census, *Documentation of Nonsampling Issues in the Survey of Industrial Research and Development*, RR94/03 (Washington, DC, Sept. 1994) and U.S. Department of Commerce, Bureau of the Census, *A Study of Processing Errors in the Survey of Industrial Research and Development*, ESMD-9403 (Washington, DC, Sept. 1994).

⁸ The weight given to a company selected for the survey is the inverse of its probability of selection. Companies selected for the sample with certainty (see Frame Creation earlier in this section) represented only themselves, and each had a weight of 1.0.

**Table B-2. Relative standard error of estimate (percentage) for selected items,
by industry and size of company: 1993**

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Industry	SIC code	Number of R&D- performing companies	Domestic net sales of R&D performers	Domestic employment of R&D performers	Number of FTE scientists and engineers	Total R&D	Company and other funds for R&D
Total.....		6,429	0.8	0.7	2.8	2.7	3.2
Food, kindred, and tobacco products.....	20,21	245	0.7	1.7	4.9	1.1	1.1
Textiles and apparel.....	22,23	170	5.9	2.4	6.4	3.4	3.6
Lumber, wood products, and furniture.....	24,25	233	1.8	2.6	32.8	2.0	2.0
Paper and allied products.....	26	106	1.6	2.0	2.0	2.9	3.0
Chemicals and allied products.....	28	441	0.7	1.1	3.7	3.3	3.6
Industrial chemicals.....	281-82,286	88	0.7	0.7	0.5	0.2	0.2
Drugs and medicines.....	283	115	1.1	2.1	7.2	6.5	6.5
Other chemicals.....	284-85,287-89	238	1.8	2.9	3.1	1.4	1.4
Petroleum refining and extraction.....	13,29	80	0.1	0.3	0.3	0.3	0.3
Rubber products.....	30	234	6.5	5.4	4.8	4.1	4.1
Stone, clay, and glass products.....	32	167	1.2	1.6	2.1	1.5	1.6
Primary metals.....	33	201	1.3	1.4	16.0	11.0	10.6
Ferrous metals and products.....	331-32,3398-99	104	1.7	1.6	27.5	14.8	12.4
Nonferrous metals and products.....	333-36	97	1.6	2.6	16.0	15.7	15.9
Fabricated metal products.....	34	462	1.1	1.3	3.2	2.4	4.2
Machinery.....	35	1,002	1.1	1.2	5.1	1.4	1.4
Office, computing, and accounting machines.....	357	244	0.9	0.7	1.3	1.1	1.1
Other machinery, except electrical.....	351-56,358-59	758	1.4	1.6	9.8	3.0	3.0
Electrical equipment.....	36	880	0.4	0.6	1.6	0.9	1.1
Radio and TV receiving equipment.....	365	35	4.0	3.4	7.3	9.0	7.0
Communication equipment.....	366	241	0.8	1.1	1.0	0.7	0.8
Electronic components.....	367	244	1.3	2.0	2.7	2.2	2.4
Other electrical equipment.....	361-64,369	360	0.3	0.4	4.4	0.5	0.6
Transportation equipment.....	37	224	0.7	0.8	0.6	0.2	0.3
Motor vehicles and motor vehicles equipment.....	371	77	1.0	1.0	0.2	0.0	0.0
Other transportation equipment.....	373-75,379	95	1.3	1.8	2.9	5.5	6.1
Aircraft and missiles.....	372,376	52	0.7	1.4	1.0	0.4	0.9
Professional and scientific instruments.....	38	531	1.1	1.7	13.2	2.0	2.7
Scientific and mechanical measuring instruments.....	381-82	282	1.6	2.3	3.3	0.9	1.5
Optical, surgical, photographic, and other instruments.....	384-87	249	1.6	2.5	39.3	4.5	4.6
Other manufacturing industries.....	27,31,39	253	4.7	5.7	40.7	7.0	7.0
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-85,87,89	1,200	2.6	2.0	7.3	10.0	11.8
Distribution by size of company: (Based on number of employees)							
Total.....		6,429	0.8	0.7	2.8	2.7	3.2
Fewer than 500.....		3,924	9.6	6.6	13.1	19.2	20.6
500 to 999.....		783	2.3	2.7	2.9	2.0	2.0
1,000 to 4,999.....		1,180	0.0	0.1	0.0	0.0	0.0
5,000 to 9,999.....		237	0.0	0.0	0.0	0.0	0.0
10,000 to 24,999.....		181	0.0	0.0	0.0	0.0	0.0
25,000 or more.....		124	0.0	0.0	0.0	0.0	0.0

See explanatory information and SOURCE at end of table.

**Table B-2. Relative standard error of estimate (percentage) for selected items,
by industry and size of company: 1993**

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Industry	SIC code	Company-financed R&D performed outside of U.S.	Company-financed R&D contracted to outside organizations	Federal funds for R&D	Total funds for basic research	Total funds for applied research	Total funds for development
Total.....		1.0	2.3	2.9	2.8	4.0	3.9
Food, kindred, and tobacco products.....	20,21	0.0	1.0	0.0	4.1	0.5	1.8
Textiles and apparel.....	22,23	0.0	11.1	0.5	12.7	2.5	6.5
Lumber, wood products, and furniture.....	24,25	0.1	17.8	3.8	13.0	3.3	2.2
Paper and allied products.....	26	0.0	0.2	0.0	7.8	1.2	7.6
Chemicals and allied products.....	28	0.0	0.6	0.3	0.6	10.1	0.3
Industrial chemicals.....	281-82,286	0.0	2.5	0.0	0.3	0.2	0.2
Drugs and medicines.....	283	0.1	0.7	31.0	0.8	17.7	0.5
Other chemicals.....	284-85,287-89	0.0	0.3	0.0	6.5	3.1	1.5
Petroleum refining and extraction.....	13,29	0.5	0.5	0.0	0.6	0.0	0.0
Rubber products.....	30	0.0	56.0	0.0	12.0	16.0	4.0
Stone, clay, and glass products.....	32	2.4	3.7	4.0	4.6	1.5	1.0
Primary metals.....	33	2.3	10.5	47.3	4.1	0.8	19.5
Ferrous metals and products.....	331-32,3398-99	0.0	13.8	63.3	7.8	2.1	25.8
Nonferrous metals and products.....	333-36	2.5	0.4	0.0	3.7	0.1	28.1
Fabricated metal products.....	34	0.4	38.6	0.2	1.2	2.8	2.6
Machinery.....	35	0.2	3.0	1.0	3.8	5.2	0.4
Office, computing, and accounting machines.....	357	0.3	2.8	1.7	9.6	3.5	1.1
Other machinery, except electrical.....	351-56,358-59	0.3	5.2	1.1	3.5	11.4	1.4
Electrical equipment.....	36	0.8	3.0	0.8	4.5	3.0	1.2
Radio and TV receiving equipment.....	365	0.0	6.2	67.7	13.0	24.5	9.6
Communication equipment.....	366	2.6	11.3	1.6	18.6	6.9	0.8
Electronic components.....	367	0.0	11.3	0.0	3.6	7.0	3.1
Other electrical equipment.....	361-64,369	0.4	2.6	0.7	3.4	0.5	0.7
Transportation equipment.....	37	0.0	0.5	0.0	1.0	0.7	0.2
Motor vehicles and motor vehicles equipment.....	371	0.0	0.5	0.0	1.1	0.2	0.0
Other transportation equipment.....	373-75,379	30.2	1.1	0.0	13.5	10.3	10.9
Aircraft and missiles.....	372,376	0.0	2.4	0.0	0.0	1.0	0.4
Professional and scientific instruments.....	38	3.6	39.4	0.3	1.1	3.2	2.2
Scientific and mechanical measuring instruments.....	381-82	0.0	35.6	0.4	0.4	3.0	0.1
Optical, surgical, photographic, and other instruments.....	384-87	4.4	48.6	0.0	1.7	7.9	5.0
Other manufacturing industries.....	27,31,39	0.5	37.8	4.1	39.7	4.6	5.1
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-85,87,89	5.2	2.1	11.5	7.0	10.2	14.2
Distribution by size of company: (Based on number of employees)							
Total.....		1.0	2.3	2.9	2.8	4.0	3.9
Fewer than 500.....		20.6	15.4	39.9	9.0	23.4	35.4
500 to 999.....		0.2	2.8	1.2	6.1	1.9	2.7
1,000 to 4,999.....		0.1	0.0	0.0	0.1	0.0	0.0
5,000 to 9,999.....		0.0	0.0	0.0	0.0	0.0	0.0
10,000 to 24,999.....		0.0	0.0	0.0	0.0	0.0	0.0
25,000 or more.....		0.0	0.0	0.0	0.0	0.0	0.0

NOTE: A description of the standard error of estimate is given in section A under "Methodology of Survey."
The percentage (or relative) standard errors in this table may be converted to standard errors of estimate by multiplying the percentages shown by the associated estimates. For example, the relative standard error of estimate for R&D performance for all company size groups in the chemicals industry (SIC 28) is shown as 1.4 percent, and the associated total R&D estimate for this industry is shown as \$16,711 million in table A-3. "Total (company and Federal) funds for industrial R&D performance by industry and size of company: 1982-92." The standard error of estimate, then, is .014 times 16,711 or 234.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

other funds, character of work (basic research, applied research, and development), company-sponsored R&D expenditures in foreign countries, R&D performed under contract by others, expenditures for pollution abatement and energy R&D, detail on R&D by product field, Federal R&D support to the firm by contracting agency, domestic R&D expenditures by State, and foreign R&D by country. The Form RD-1S requests the same information except for the last four items. Because companies receiving the Forms RD-1L and RD-1S generally have participated in previous surveys, computer imprinted data reported by the company for the previous year are supplied for reference. Companies are encouraged to revise or update this imprinted data if they have more current information.

As a further limit on reporting burden on small R&D performers and on firms that are included in the sample for the first time, an even more abbreviated form is used each year. Form RD-1A collects data only on R&D, sales, employment, and operational status and includes a screening item that allows respondents to indicate that they do not perform R&D. No prior-year information is available since the majority of the companies have not reported previously.

For the 1993 survey, about 2,300 companies that reported \$1 million or more in R&D spending in the 1992 survey received Form RD-1L and nearly 21,600 received Form RD-1A. Of the 23,900 firms, 6,400 reported R&D expenditures. Both questionnaires and the instructions provided to respondents are reproduced in section C, Survey Documents.

FOLLOW-UP FOR SURVEY NONRESPONSE

The 1993 survey questionnaires were mailed in May 1994, and recipients were asked to respond within 60 days. Thirty days later, letters were mailed to all survey recipients reminding them that their completed questionnaire was due within the next 30 days. Copies of the Form RD-1A and instructions were faxed to respondents who called a toll-free telephone number indicated in the follow-up letters. After 60 days, follow-up letters were sent to all nonresponding firms. Two additional follow-up mailings were made to persistent nonrespondents, after 90 and 120 days.

In addition to the mailings, telephone follow-up was used to encourage response from those firms ranked among the 300 largest R&D performers, based on total R&D expenditures reported in the previous survey. Telephone follow-up was also used for these firms during the initial data edit phase of survey operations if data items were missing or unclear. Table B-3 shows the number of companies in each industry or industry group that received a questionnaire and the percentage that responded to the survey.

IMPUTATION FOR ITEM NONRESPONSE

For various reasons, many firms chose to return the survey questionnaires with one or more blank items.⁹ For instance, the internal accounting procedures of the firm may not have allowed it to quantify the pollution-abatement expenditures portion of R&D. In addition, some firms, as a matter of policy, refused to answer any voluntary questions.¹⁰

When respondents did not provide the requested information, estimates for the missing data were made using imputation algorithms. In general, the imputation algorithms computed values for missing items by applying the average percentage change for the target item in the nonresponding firm's industry to the item's prior-year value for that firm, reported or imputed. This approach, with minor variation, was used for most items.¹¹ Table B-4 contains imputation rates for the principal survey items.

⁹ For detailed discussions on the sources, control, and measurement of error resulting from item nonresponse, see the technical report: U.S. Department of Commerce, Bureau of the Census, *Documentation of Nonsampling Error Issues in the Survey of Industrial Research and Development*, RR94/03 (Washington, DC, Sept. 21, 1994). For a general discussion of the problems stemming from item nonresponse, see the technical report: National Science Foundation, *Estimating Basic and Applied Research and Development in Industry: A Preliminary Review of Survey Procedures*, NSF 90-322 (Washington, DC, 1990).

¹⁰ All but four items—total R&D, Federal R&D, net sales, and total employment—which are included in the Census Bureau's annual mandatory statistical program, are voluntary. See further discussion under Response Rates and Mandatory Versus Voluntary Reporting, later in this section.

¹¹ For detailed descriptions and analyses of the imputation methods and algorithms used, see the technical report: U.S. Department of Commerce, Bureau of the Census, *An Evaluation of Imputation Methods for the Survey of Industrial Research and Development*, ESMD-9404 (Washington, DC, Sept. 1994).

Table B-3: Unit response rates—percentage of companies responding to survey, by industry: 1993

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Industry	SIC code	Number of companies that received questionnaire	Response rate 1/
Total, all companies.....		23,923	81.8
Distribution by industry:			
Food, kindred, and tobacco products.....	20,21	623	83.6
Textiles and apparel.....	22,23	1,079	75.3
Lumber, wood products, and furniture.....	24,25	1,794	80.2
Paper and allied products.....	26	406	85.7
Chemicals and allied products.....	28	576	88.4
Industrial chemicals.....	281-82,286	116	86.2
Drugs and medicines.....	283	130	89.2
Other chemicals.....	284-85,287-89	330	88.8
Petroleum refining and extraction.....	13,29	280	83.2
Rubber products.....	30	503	82.1
Stone, clay, and glass products.....	32	812	80.0
Primary metals.....	33	789	85.4
Ferrous metals and products.....	331-32,3398-99	345	86.1
Nonferrous metals and products.....	333-36	444	84.9
Fabricated metal products.....	34	1,910	80.6
Machinery.....	35	1,869	81.9
Office, computing, and accounting machines.....	357	409	70.4
Other machinery, except electrical.....	351-56,358-59	1,460	85.1
Electrical equipment.....	36	1,628	79.4
Radio and TV receiving equipment.....	365	110	79.1
Communication equipment.....	366	338	79.9
Electronic components.....	367	387	81.1
Other electrical equipment.....	361-64,369	793	78.4
Transportation equipment.....	37	539	79.6
Motor vehicles and motor vehicles equipment.....	371	122	86.1
Other transportation equipment.....	373-75,379	352	76.4
Aircraft and missiles.....	372,376	65	84.6
Professional and scientific instruments.....	38	756	81.7
Scientific and mechanical measuring instruments.....	381-82	340	85.9
Optical, surgical, photographic, and other instruments.....	384-87	416	78.4
Other manufacturing industries.....	27,31,39	1,454	80.8
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-85,87,89	8,905	82.9

See explanatory information and SOURCE at end of table.

Table B-3: Unit response rates—percentage of companies responding to survey, by industry: 1993

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Industry	SIC code	Number of companies that received questionnaire	Response rate 1/
Total, companies receiving Form RD-1L.....		2,256	88.1
Distribution by industry:			
Food, kindred, and tobacco products.....	20,21	66	86.4
Textiles and apparel.....	22,23	36	86.1
Lumber, wood products, and furniture.....	24,25	22	90.9
Paper and allied products.....	26	41	95.1
Chemicals and allied products.....	28	220	89.5
Industrial chemicals.....	281-82,286	69	92.8
Drugs and medicines.....	283	69	87.0
Other chemicals.....	284-85,287-89	82	89.0
Petroleum refining and extraction.....	13,29	27	92.6
Rubber products.....	30	65	84.6
Stone, clay, and glass products.....	32	31	96.8
Primary metals.....	33	52	94.2
Ferrous metals and products.....	331-32,3398-99	28	96.4
Nonferrous metals and products.....	333-36	24	91.7
Fabricated metal products.....	34	85	95.3
Machinery.....	35	334	88.8
Office, computing, and accounting machines.....	357	111	82.0
Other machinery, except electrical.....	351-56,358-59	223	89.2
Electrical equipment.....	36	317	88.0
Radio and TV receiving equipment.....	365	8	87.5
Communication equipment.....	366	92	89.1
Electronic components.....	367	126	88.1
Other electrical equipment.....	361-64,369	91	86.8
Transportation equipment.....	37	88	89.8
Motor vehicles and motor vehicles equipment.....	371	42	95.2
Other transportation equipment.....	373-75,379	13	76.9
Aircraft and missiles.....	372,376	33	87.9
Professional and scientific instruments.....	38	275	87.3
Scientific and mechanical measuring instruments.....	381-82	151	91.4
Optical, surgical, photographic, and other instruments.....	384-87	124	82.3
Other manufacturing industries.....	27,31,39	58	89.7
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-78, 78-79,80-81, 83-85,87,89	539	85.9

See explanatory information and SOURCE at end of table.

Table B-3: Unit response rates—percentage of companies responding to survey, by industry: 1993

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Industry	SIC code	Number of companies that received questionnaire	Response rate 1/
Total, companies receiving Form RD-1A.....		21,667	81.1
Distribution by industry:			
Food, kindred, and tobacco products.....	20,21	557	83.3
Textiles and apparel.....	22,23	1,043	74.9
Lumber, wood products, and furniture.....	24,25	1,772	80.0
Paper and allied products.....	26	365	84.7
Chemicals and allied products.....	28	356	87.6
Industrial chemicals.....	281-82,286	47	76.6
Drugs and medicines.....	283	61	91.8
Other chemicals.....	284-85,287-89	248	88.7
Petroleum refining and extraction.....	13,29	253	82.2
Rubber products.....	30	438	81.7
Stone, clay, and glass products.....	32	781	79.4
Primary metals.....	33	737	84.8
Ferrous metals and products.....	331-32,3398-99	317	85.2
Nonferrous metals and products.....	333-36	420	84.5
Fabricated metal products.....	34	1,825	79.9
Machinery.....	35	1,535	80.8
Office, computing, and accounting machines.....	357	298	86.1
Other machinery, except electrical.....	351-56,358-59	1,237	84.4
Electrical equipment.....	36	1,311	77.3
Radio and TV receiving equipment.....	365	102	78.4
Communication equipment.....	366	246	76.4
Electronic components.....	367	261	77.8
Other electrical equipment.....	361-64,369	702	77.4
Transportation equipment.....	37	451	77.6
Motor vehicles and motor vehicles equipment.....	371	80	81.3
Other transportation equipment.....	373-75,379	339	76.4
Aircraft and missiles.....	372,376	32	81.3
Professional and scientific instruments.....	38	481	78.6
Scientific and mechanical measuring instruments.....	381-82	189	81.5
Optical, surgical, photographic, and other instruments.....	384-87	292	76.7
Other manufacturing industries.....	27,31,39	1,396	80.4
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-85,87,89	8,366	82.7

1/ The calculation of the response rate was based on all companies that responded to the survey, including those that reported they were out of scope, out of business, or had merged with another company. It excludes RD-1L companies for which total R&D expenditure data were imputed.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table B-4. Imputation rates for selected items, by industry: 1993

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Industry	SIC code	Net sales	Total employment	R&D scientists and engineers	R&D		
					Total	Company	Federal
	[Percent]						
Total		5.4	6.1	29.6	5.0	5.2	4.3
Food, kindred, and tobacco products	20,21	7.5	10.7	31.2	6.1	6.4	-
Textiles and apparel	22,23	17.4	15.7	33.4	18.9	16.2	92.3
Lumber, wood products, and furniture	24,25	1.8	12.9	11.4	3.2	2.9	30.6
Paper and allied products	26	7.9	8.8	24.1	3.2	3.3	0.0
Chemicals and allied products	28	10.5	8.6	26.8	4.0	4.2	1.8
Industrial chemicals	281-82,286	6.2	5.1	34.3	4.0	5.1	0.1
Drugs and medicines	283	1.2	1.6	22.5	1.0	1.0	0.0
Other chemicals	284-85,287-89	23.0	20.8	25.7	15.8	15.0	95.9
Petroleum refining and extraction	13,29	4.4	4.5	35.5	1.2	1.7	3.2
Rubber products	30	3.7	9.3	24.4	4.3	4.5	0.0
Stone, clay, and glass products	32	4.5	5.0	16.2	5.7	6.9	0.1
Primary metals	33	4.6	5.6	25.6	8.2	8.1	9.4
Ferrous metals and products	331-32,3398-99	1.5	1.8	15.2	6.6	7.0	0.0
Nonferrous metals and products	333-36	10.4	12.1	36.1	9.4	8.9	37.1
Fabricated metal products	34	1.6	2.7	21.1	0.9	1.7	0.1
Machinery	35	9.9	11.1	22.2	12.3	12.7	7.4
Office, computing, and accounting machines	357	14.8	26.3	23.8	15.4	15.9	0.1
Other machinery, except electrical	351-56,358-59	8.3	7.0	20.7	8.1	8.1	11.9
Electrical equipment	36	8.1	4.1	35.5	12.7	12.3	16.0
Radio and TV receiving equipment	365	20.4	15.4	34.9	0.0	0.0	0.0
Communication equipment	366	32.7	2.4	68.6	33.5	37.6	8.4
Electronic components	367	5.5	5.8	18.6	6.6	3.3	79.5
Other electrical equipment	361-64,369	2.4	3.3	19.0	1.1	1.3	0.2
Transportation equipment	37	1.2	2.0	31.9	0.5	0.6	0.3
Motor vehicles and motor vehicles equipment	371	0.1	0.4	37.5	0.1	0.2	0.0
Other transportation equipment	373-75,379	20.4	18.1	67.6	30.9	22.2	99.5
Aircraft and missiles	372,376	1.5	2.3	26.7	0.4	0.7	0.1
Professional and scientific instruments	38	11.2	10.2	59.1	6.5	8.7	0.7
Scientific and mechanical measuring instruments	381-82	5.6	4.6	73.1	4.4	7.8	0.6
Optical, surgical, photographic, and other instruments	383-87	16.7	16.8	30.8	9.3	9.4	4.6
Other manufacturing industries	21,27,31,39	2.3	5.7	19.7	4.2	4.4	0.0
Nonmanufacturing industries	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-85,87,89	3.7	4.3	15.8	4.2	2.7	11.3

See explanatory information and SOURCE at end of table.

Table B-4. Imputation rates for selected items, by industry: 1993

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Industry	SIC code	R&D by cost			R&D by stage	Energy R&D	Pollution abatement	Outside company	Foreign R&D
		Wages	Materials	Other costs					
		[Percent]							
Total		45.9	46.3	47.3	41.0	6.6	7.1	18.3	5.6
Food, kindred, and tobacco products	20,21	37.5	38.4	37.4	33.9	-	56.9	4.0	20.6
Textiles and apparel	22,23	51.8	51.5	51.4	46.8	-	0.0	9.5	0.0
Lumber, wood products, and furniture	24,25	43.3	31.8	59.5	48.9	17.3	32.3	6.4	3.7
Paper and allied products	26	76.0	85.1	81.5	74.8	6.2	3.4	94.3	0.2
Chemicals and allied products	28	43.4	45.0	41.8	43.3	2.4	13.2	23.1	1.5
Industrial chemicals	281-82,286	56.2	55.8	56.2	67.0	2.4	7.5	73.4	0.6
Drugs and medicines	283	35.5	35.4	35.4	27.5	-	0.0	12.0	0.1
Other chemicals	284-85,287-89	31.3	29.6	31.3	31.4	0.0	76.6	42.8	5.5
Petroleum refining and extraction	13,29	37.9	38.2	38.2	30.2	13.4	10.5	25.0	4.5
Rubber products	30	37.6	36.7	36.8	37.4	28.0	44.4	1.3	0.6
Stone, clay, and glass products	32	34.8	35.6	34.5	32.9	0.0	0.0	44.9	0.0
Primary metals	33	45.2	55.8	45.0	44.8	0.0	0.0	36.0	3.4
Ferrous metals and products	331-32,3398-99	20.8	22.5	20.7	15.3	0.0	0.0	47.1	0.0
Nonferrous metals and products	333-36	65.1	64.6	66.5	65.3	0.0	0.0	0.0	3.7
Fabricated metal products	34	60.4	59.8	59.6	59.8	0.0	2.9	7.2	11.0
Machinery	35	40.1	39.1	45.6	35.9	5.2	0.8	19.5	12.4
Office, computing, and accounting machines	357	43.5	43.1	47.9	34.8	-	0.0	30.7	14.2
Other machinery, except electrical	351-56,358-59	34.8	36.3	40.7	37.7	5.2	0.8	8.8	11.6
Electrical equipment	36	56.5	51.1	53.9	43.7	0.0	0.0	1.0	27.1
Radio and TV receiving equipment	365	32.5	28.8	28.4	85.8	-	-	0.0	0.0
Communication equipment	366	77.8	77.8	77.8	63.8	0.0	0.0	0.0	79.1
Electronic components	367	52.7	54.7	53.6	35.9	0.0	0.0	4.3	2.7
Other electrical equipment	361-64,369	33.8	33.5	33.6	34.3	0.0	0.0	0.4	2.0
Transportation equipment	37	53.0	48.8	61.6	51.7	0.8	2.2	19.3	5.0
Motor vehicles and motor vehicles equipment	371	35.1	33.9	34.1	34.3	0.0	0.0	12.6	0.0
Other transportation equipment	373-75,379	85.5	90.7	89.3	92.5	-	0.0	44.2	0.0
Aircraft and missiles	372,376	68.9	66.6	75.5	64.5	0.8	3.8	54.3	43.7
Professional and scientific instruments	38	79.8	79.5	81.0	56.7	0.0	0.0	7.1	5.8
Scientific and mechanical measuring instruments	381-82	82.0	82.4	82.0	69.2	-	0.0	4.2	29.5
Optical, surgical, photographic, and other instruments	383-87	76.8	76.5	79.0	38.3	0.0	0.0	7.8	0.3
Other manufacturing industries	21,27,31,39	46.3	48.4	52.8	38.9	-	0.0	1.1	3.4
Nonmanufacturing industries	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-85,87,89	20.9	21.9	20.0	18.6	7.0	25.7	13.5	4.3

- = no basis for imputation

SOURCE: National Science Foundation/SRS, Research and Development in Industry: 1993

RESPONSE RATES AND MANDATORY VERSUS VOLUNTARY REPORTING

Current survey reporting requirements divide survey items into two groups: mandatory and voluntary. Response to four data items on the questionnaires, total R&D expenditures, Federal R&D funds, net sales, and total employment, is mandatory, whereas response to the remaining items is voluntary. During the 1990 survey cycle, NSF conducted a test of the effect of reporting on a completely voluntary basis to determine if combining both mandatory and voluntary items on one questionnaire influences response rates. For this test, the 1990 sample was divided into two panels of approximately equal size. One panel, the mandatory panel, was asked to report as usual (four mandatory items and the remainder voluntary), and the other panel, the voluntary panel, was asked to report all items on a completely voluntary basis. The result of the test was a decrease in the overall survey response rate to 80 percent from levels of 88 percent in 1989 and 89 percent in 1988. The response rates for the mandatory and voluntary panels were 89 percent and 69 percent, respectively. Detailed results of the test were published in *Research and Development in Industry: 1990*. For firms that reported R&D expenditures in 1993, table B-5 shows the percentage that also reported data for other selected items.

CHARACTER OF WORK

Response to questions about character of work (basic research, applied research, and development) declined in the mid-1980s, and, as a result, imputation rates increased. The general imputation procedure described above became increasingly dependent upon information imputed in prior years, thereby distancing current-year estimates from any reported information. Because of the increasing dependence on imputed data, NSF chose not to publish character-of-work estimates in 1986. Consequently, the imputation procedure used to develop these estimates was revised in 1987 for use with 1986 and later data and differs from the general imputation approach. The new method calculates the character-of-work distribution for a nonresponding firm only if that firm reported a distribution within a five-year period, extending from two years before to two years after the year requiring imputation. Imputation for a given year is initially performed in the year the data are collected and is based on a character-of-work distribution reported in either of the two previous years, if any. It is again

performed using new data collected in the next two years. Thus, character-of-work estimates are revised as newly reported information becomes available and are not final for two years following their initial publication.

If no reported data are available for a firm, character-of-work estimates are not imputed. As a consequence, only a portion of the total estimated R&D expenditures are distributed at the firm level. Those expenditures not meeting the requirements of the new imputation methodology are placed in a "not distributed" category. Tables B-6, B-7, and B-8 show the character-of-work estimates along with the "not distributed" component for 1991, 1992, and 1993, respectively.

NSF's objective in conducting the survey has always been to provide estimates for the entire population of firms performing R&D in the United States. However, the revised imputation procedure would no longer produce such estimates because of the "not distributed" component. So, a baseline estimation method was developed to allocate the "not distributed" amounts among the character-of-work components. In the baseline estimation method, the "not distributed" expenditures are allocated by industry group to basic research, applied research, and development categories, using the percentage splits in the distributed category for that industry. The allocation is done at the lowest level of published industry detail only; higher levels are derived by aggregation (just as national totals are derived by aggregation of individual industry estimates) and result in higher performance shares for basic and applied research and lower estimates for development's share than would have been calculated using the previous method.¹² The estimates of basic research, applied research, and development provided in section A of this report were calculated using the baseline estimation method.

¹² See the NSF technical report cited previously for an explanation of the uncertainties in the data and to quantify their sensitivity to the choice of various possible imputation procedures.

Table B-5. Item response rates—percentage of R&D-performing companies that responded to selected survey items: 1993

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Data item	Response rate 1/	
	Form RD-1L 2/	Form RD-1A 2/
Sales.....	98.7	99.1
Total employment.....	97.8	98.5
Scientists and engineers.....	79.1	85.3
Federal R&D	99.3	98.8
Company R&D	3/	3/
Total R&D	100.0	100.0
Foreign R&D.....	44.9	53.0
Contracted out.....	37.2	60.1
Energy R&D.....	45.2	4/
Pollution abatement R&D.....	45.2	4/

1/ Response rates are based on reported data for companies that reported total R&D expenditures. Imputed data are not included. Companies that reported that they were out of scope, out of business, merged with another company, or had no R&D expenditures for 1993 were excluded from the calculation of response rates.

2/ See technical notes for descriptions of the survey questionnaire forms.

3/ Item response for "Federal R&D" and for "Company R&D" were considered together; companies that reported "Total R&D" and either of these expenditures implicitly reported both company and Federal R&D, since these two items sum to total R&D.

4/ The Form RD-1A did not include these items. See technical notes for more information about contents of the questionnaire.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

Table B-6. Funds for performance of basic research, applied research, and development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1991

Page 1 of 2

Distribution by industry	SIC code	Total			Basic			Applied		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[Dollars in millions]								
Total.....		\$116,952	\$26,372	\$90,580	\$6,490	\$1,220	\$5,270	\$22,319	\$4,808	\$17,511
Food, kindred, and tobacco products.....	20,21	1,277	0	1,277	126	0	126	386	0	386
Textiles and apparel.....	22,23	(D)	(D)	236	13	0	13	(D)	(D)	29
Lumber, wood products, and furniture.....	24,25	(D)	(D)	200	13	0	13	61	0	61
Paper and allied products.....	26	(D)	(D)	1,174	(D)	0	(D)	(D)	(D)	(J)
Chemicals and allied products.....	28	14,648	209	14,439	1,304	7	1,297	3,882	(S)	3,855
Industrial chemicals.....	281-82,286	5,390	165	5,225	447	4	443	(D)	(D)	1,160
Drugs and medicines.....	283	(D)	(D)	6,947	(D)	(D)	738	(D)	(D)	1,993
Other chemicals.....	284-85,287-89	(D)	(D)	2,267	(D)	(D)	116	705	3	702
Petroleum refining and extraction.....	13,29	2,498	11	2,487	(D)	(D)	(D)	(D)	(D)	715
Rubber products.....	30	(D)	(D)	(D)	(D)	(D)	(D)	237	0	237
Stone, clay, and glass products.....	32	(D)	(D)	455	48	0	48	(D)	(D)	154
Primary metals.....	33	714	8	706	33	0	33	(D)	(D)	(S)
Ferrous metals and products.....	331-32,3398-99	(D)	(D)	225	8	0	8	(D)	(D)	(D)
Nonferrous metals and products.....	333-36	(D)	(D)	481	25	0	25	(D)	(D)	(D)
Fabricated metal products.....	34	974	226	748	38	0	38	(D)	(D)	(D)
Machinery.....	35	14,775	1,055	13,720	(D)	(D)	288	(D)	(D)	1,749
Office, computing, and accounting machines.....	357	(D)	(D)	10,419	(D)	(D)	(D)	(D)	(D)	1,053
Other machinery, except electrical.....	351-56,358-59	(D)	(D)	3,301	(D)	(D)	(D)	714	18	696
Electrical equipment.....	36	13,415	4,550	8,865	230	21	209	(D)	(D)	1,985
Radio and TV receiving equipment.....	365	102	0	102	(D)	0	(D)	8	0	8
Communication equipment.....	366	(D)	(D)	(S)	(D)	(D)	(D)	(D)	(D)	552
Electronic components.....	367	3,465	288	3,177	(D)	(D)	96	739	(S)	696
Other electrical equipment.....	361-64,369	(D)	(D)	2,403	(D)	(D)	(D)	(D)	(D)	729
Transportation equipment.....	37	27,428	12,570	14,858	383	227	156	(D)	(D)	(D)
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)	9,063	70	0	70	(D)	(D)	(D)
Other transportation equipment.....	373-75,379	(D)	(D)	262	(S)	0	(S)	(D)	(D)	(D)
Aircraft and missiles.....	372,376	16,983	11,450	5,533	290	227	63	1,667	830	837
Professional and scientific instruments.....	38	8,705	1,965	6,840	(D)	(D)	361	1,976	373	1,603
Scientific and mechanical measuring instruments.....	381-82	(D)	(D)	3,017	(D)	(D)	138	(D)	(D)	933
Optical, surgical, photographic, and other instruments.....	383-87	(D)	(D)	3,823	(D)	(D)	223	(D)	(D)	670
Other manufacturing industries.....	27,31,39	(D)	(D)	(D)	64	0	64	(D)	(D)	65
Nonmanufacturing industries.....	07-10, 12-17, 40-42, 44-49, 50-59, 60-65, 67, 701, 73, 75-76, 78-79, 80-81, 83-84, 87, 89	28,446	5,505	22,941	3,239	950	2,289	5,786	1,260	4,526

See explanatory information and SOURCE at end of table.

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Table B-6. Funds for performance of basic research, applied research, and development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1991

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Distribution by industry	SIC code	Development			Expenditures not distributed			Percent of expenditures not distributed		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[Dollars in millions]								
Total.....		\$66,317	\$14,749	\$51,568	\$21,826	\$5,595	\$16,231	18.7%	21.2%	17.9%
Food, kindred, and tobacco products.....	20,21	576	0	576	189	0	(S)	14.8	0.0	14.9
Textiles and apparel.....	22,23	134	6	128	(D)	(D)	(S)	30.7	60.0	27.1
Lumber, wood products, and furniture.....	24,25	(D)	(D)	100	26	0	(S)	(D)	0.0	13.0
Paper and allied products.....	26	437	0	437	214	0	(S)	(D)	0.0	18.2
Chemicals and allied products.....	28	6,734	62	6,672	(D)	(D)	2,616	(D)	(D)	18.1
Industrial chemicals.....	281-82,286	2,760	58	2,702	(D)	(D)	920	(D)	(D)	17.6
Drugs and medicines.....	283	2,725	0	2,725	1,491	0	1,491	(D)	0.0	21.5
Other chemicals.....	284-85,287-89	1,249	4	1,245	(D)	(D)	204	10.2	78.9	9.0
Petroleum refining and extraction.....	13,29	992	5	987	(D)	0	(D)	(D)	0.0	(D)
Rubber products.....	30	413	0	413	462	0	(S)	(D)	0.0	(D)
Stone, clay, and glass products.....	32	(D)	(D)	229	24	0	(S)	(D)	0.0	5.3
Primary metals.....	33	308	2	306	(D)	(D)	(S)	13.4	12.5	13.5
Ferrous metals and products.....	331-32,3398-99	(D)	(D)	100	(D)	0	(D)	(D)	(D)	5.3
Nonferrous metals and products.....	333-36	(D)	(D)	(S)	85	(D)	(D)	(D)	25.0	(D)
Fabricated metal products.....	34	(D)	(D)	461	160	(D)	(D)	16.4	(D)	(D)
Machinery.....	35	9,862	574	9,288	2,428	(S)	(S)	16.4	3.2	17.4
Office, computing, and accounting machines.....	357	(D)	(D)	7,125	2,084	(D)	(D)	(D)	0.6	(D)
Other machinery, except electrical.....	351-56,358-59	(D)	(D)	2,163	344	(D)	(D)	(D)	17.1	(D)
Electrical equipment.....	36	7,369	2,671	4,698	(D)	(D)	(S)	18.6	11.4	22.3
Radio and TV receiving equipment.....	365	82	0	82	(D)	0	(D)	(D)	0.0	(D)
Communication equipment.....	366	(D)	(D)	1,447	(D)	(D)	(D)	32.6	25.6	36.1
Electronic components.....	367	(D)	(D)	2,076	336	(S)	309	9.7	9.4	9.7
Other electrical equipment.....	361-64,369	(D)	(D)	1,093	591	(D)	(D)	11.7	3.0	21.3
Transportation equipment.....	37	18,359	8,249	10,110	(D)	(D)	(D)	(D)	(D)	(D)
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)	(D)	(D)	(D)	(D)	26.2	0.4	(D)
Other transportation equipment.....	373-75,379	(D)	(D)	(D)	7	0	7	(D)	0.0	2.7
Aircraft and missiles.....	372,376	11,580	7,541	4,039	3,446	(S)	(S)	20.3	24.9	10.7
Professional and scientific instruments.....	38	4,533	1,107	3,426	(D)	(D)	(S)	(D)	(D)	21.2
Scientific and mechanical measuring instruments.....	381-82	(D)	(D)	1,342	(D)	(D)	604	20.3	20.8	20.0
Optical, surgical, photographic, and other instruments.....	383-87	(D)	(D)	2,084	(D)	(D)	(S)	21.8	5.7	22.1
Other manufacturing industries.....	27,31,39	391	60	331	38	0	(S)	(D)	(D)	(D)
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	15,057	1,650	13,407	4,364	1,645	2,719	15.3	29.9	11.9

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

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Table B-7. Funds for performance of basic research, applied research, and development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1992

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Distribution by industry	SIC code	Total			Basic			Applied		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[Dollars in millions]								
Total.....		\$119,110	\$24,722	\$94,388	\$6,094	\$912	\$5,182	\$22,817	\$4,329	\$18,488
Food, kindred, and tobacco products.....	20,21	1,386	0	1,386	116	0	116	400	0	400
Textiles and apparel.....	22,23	(D)	(D)	261	23	0	23	(D)	(D)	28
Lumber, wood products, and furniture.....	24,25	(D)	(D)	234	(D)	0	(D)	75	0	75
Paper and allied products.....	26	(D)	(D)	1,182	(D)	0	(D)	(D)	(D)	421
Chemicals and allied products.....	28	15,381	(S)	15,091	(D)	(D)	1,714	4,422	16	4,406
Industrial chemicals.....	281-82,286	5,165	(S)	4,911	(D)	(D)	481	1,099	14	1,085
Drugs and medicines.....	283	7,944	(S)	7,934	(D)	(D)	1,104	(D)	(D)	2,568
Other chemicals.....	284-85,287-89	2,272	(S)	2,246	(D)	(D)	129	(D)	(D)	743
Petroleum refining and extraction.....	13,29	2,277	9	2,268	(D)	(D)	(D)	788	0	788
Rubber products.....	30	(D)	(D)	1,256	63	0	63	161	0	161
Stone, clay, and glass products.....	32	(D)	(D)	479	(D)	(D)	40	(D)	(D)	168
Primary metals.....	33	522	(S)	514	(D)	(D)	27	208	(S)	201
Ferrous metals and products.....	331-32,3398-99	(D)	(D)	221	(D)	(D)	(D)	91	0	91
Nonferrous metals and products.....	333-36	(D)	(D)	293	(D)	0	(D)	117	(S)	110
Fabricated metal products.....	34	1,017	294	723	(D)	(D)	(D)	(D)	(D)	125
Machinery.....	35	14,938	1,035	13,903	(D)	(D)	(D)	(D)	(D)	1,493
Office, computing, and accounting machines.....	357	(D)	(D)	10,614	(D)	(D)	(D)	(D)	(D)	743
Other machinery, except electrical.....	351-56,358-59	(D)	(D)	3,289	(D)	(D)	138	769	19	750
Electrical equipment.....	36	13,360	3,844	9,516	(D)	(D)	279	(D)	(D)	2,151
Radio and TV receiving equipment.....	365	(D)	(D)	93	8	(D)	(D)	8	0	8
Communication equipment.....	366	(D)	(D)	3,381	(D)	(D)	(D)	(D)	(D)	491
Electronic components.....	367	3,567	247	3,320	111	(D)	(D)	824	53	771
Other electrical equipment.....	361-64,369	(D)	(D)	2,722	(D)	(D)	(D)	(D)	(D)	881
Transportation equipment.....	37	27,494	11,202	16,292	336	214	122	2,132	(D)	(D)
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)	9,133	62	0	62	(D)	(D)	(D)
Other transportation equipment.....	373-75,379	(D)	(D)	289	26	0	26	(D)	(D)	(D)
Aircraft and missiles.....	372,376	17,158	(S)	6,871	248	214	34	1,606	889	717
Professional and scientific instruments.....	38	9,542	2,221	7,321	407	(D)	(D)	2,052	364	1,688
Scientific and mechanical measuring instruments.....	381-82	5,156	2,143	3,013	(D)	(D)	(D)	(D)	(D)	955
Optical, surgical, photographic, and other instruments.....	384-87	4,386	78	4,308	(D)	(D)	260	(D)	(D)	733
Other manufacturing industries.....	27,31,39	(D)	(D)	599	71	0	71	(D)	(D)	84
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	28,933	5,570	23,363	2,044	655	1,389	6,531	1,417	5,114

See explanatory information and SOURCE at end of table.

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Table B-7. Funds for performance of basic research, applied research, and development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1992

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Distribution by industry	SIC code	Development			Expenditures not distributed			Percent of expenditures not distributed		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
		[Dollars in millions]								
Total.....		\$72,826	\$16,309	\$56,517	\$17,373	\$3,185	\$14,188	14.6%	12.9%	15.0%
Food, kindred, and tobacco products.....	20,21	705	0	705	165	0	(S)	11.9	0.0	11.9
Textiles and apparel.....	22,23	143	4	139	(D)	(D)	71	29.1	58.8	27.2
Lumber, wood products, and furniture.....	24,25	(D)	(D)	124	19	0	(S)	(D)	0.0	8.1
Paper and allied products.....	26	409	0	409	(D)	0	(D)	(D)	0.0	17.4
Chemicals and allied products.....	28	(D)	(D)	7,050	1,960	(S)	(S)	12.7	10.7	12.8
Industrial chemicals.....	281-82,286	(D)	(D)	2,890	460	6	455	8.9	2.4	9.3
Drugs and medicines.....	283	(D)	(D)	2,977	(D)	(D)	(S)	(D)	(D)	16.2
Other chemicals.....	284-85,287-89	(D)	(D)	1,183	(D)	(D)	(S)	(D)	(D)	8.5
Petroleum refining and extraction.....	13,29	768	8	759	(D)	0	(D)	(D)	0.0	(D)
Rubber products.....	30	(D)	(D)	814	218	0	(S)	(D)	0.0	17.4
Stone, clay, and glass products.....	32	(D)	(D)	250	21	0	(S)	(D)	0.0	4.4
Primary metals.....	33	(D)	(D)	252	35	0	(S)	6.7	0.0	6.8
Ferrous metals and products.....	331-32,3398-99	(D)	(D)	107	(D)	0	(D)	6.7	0.0	(D)
Nonferrous metals and products.....	333-36	(D)	(D)	145	(D)	0	(D)	6.7	0.0	(D)
Fabricated metal products.....	34	645	227	418	198	(D)	(D)	19.5	(D)	(D)
Machinery.....	35	9,891	571	9,320	(D)	(D)	(D)	(D)	(D)	(D)
Office, computing, and accounting machines.....	357	(D)	(D)	7,175	(D)	(D)	(D)	19.6	0.6	21.2
Other machinery, except electrical.....	351-56,358-59	(D)	(D)	2,145	267	(S)	(S)	(D)	(D)	7.8
Electrical equipment.....	36	7,516	2,298	5,218	(S)	(S)	(S)	17.9	13.5	19.6
Radio and TV receiving equipment.....	365	(D)	(D)	72	(D)	0	(D)	(D)	0.0	(D)
Communication equipment.....	366	(D)	(D)	1,664	(D)	(D)	(D)	(D)	26.9	(D)
Electronic components.....	367	2,438	165	2,273	194	(D)	(D)	5.4	(D)	(D)
Other electrical equipment.....	361-64,369	(D)	(D)	1,209	589	(D)	(D)	(D)	3.9	(D)
Transportation equipment.....	37	20,677	9,117	11,560	4,349	(D)	(D)	15.8	(D)	(D)
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)	(D)	(D)	(D)	(D)	30.2	0.2	(D)
Other transportation equipment.....	373-75,379	(D)	(D)	(D)	(D)	0	(D)	(D)	0.0	(D)
Aircraft and missiles.....	372,376	13,961	8,268	5,693	1,343	(S)	(S)	7.8	8.9	6.2
Professional and scientific instruments.....	38	5,823	1,835	3,988	1,260	(D)	(D)	13.2	(D)	(D)
Scientific and mechanical measuring instruments.....	381-82	3,363	1,775	1,588	346	(D)	(D)	6.7	(D)	(D)
Optical, surgical, photographic, and other instruments.....	384-87	2,460	60	2,400	914	0	914	20.8	0.0	21.2
Other manufacturing industries.....	27,31,39	(D)	(D)	377	67	0	67	(D)	0.0	11.2
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-85,87, 701,73,75-76, 78-79,80-81, 83-84,87,89	17,040	1,905	15,135	3,310	1,593	1,725	11.5	28.6	7.4

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

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Table B-8. Funds for performance of basic research, applied research, and development, funds not distributed, and percent of funds not distributed, by industry and source of funds: 1993

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Distribution by industry	SIC code	Total			Basic			Applied		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
[Dollars in millions]										
Total.....		\$118,334	\$22,813	\$95,521	\$7,173	\$987	\$6,186	\$22,144	\$4,796	\$17,348
Food, kindred, and tobacco products.....	20,21	1,338	0	1,338	83	0	83	367	0	367
Textiles and apparel.....	22,23	(D)	(D)	288	31	0	31	(D)	(D)	26
Lumber, wood products, and furniture.....	24,25	(D)	(D)	248	(D)	(D)	13	79	0	79
Paper and allied products.....	26	(D)	(D)	1,252	167	0	167	(D)	(D)	457
Chemicals and allied products.....	28	(D)	(D)	16,747	2,121	13	2,108	(D)	(D)	5,289
Industrial chemicals.....	281-82,286	(D)	(D)	5,274	(D)	(D)	885	(D)	(D)	1,201
Drugs and medicines.....	283	9,147	14	9,133	(D)	(D)	1,068	3,379	8	3,371
Other chemicals.....	284-85,287-89	(D)	(D)	2,340	(D)	(D)	155	(D)	(D)	718
Petroleum refining and extraction.....	13,29	2,117	14	2,103	(D)	(D)	(D)	(D)	(D)	615
Rubber products.....	30	(D)	(D)	1,092	(D)	0	(D)	(D)	(D)	125
Stone, clay, and glass products.....	32	(D)	(D)	535	(D)	(D)	(D)	(D)	(D)	165
Primary metals.....	33	669	23	646	(D)	(D)	43	(D)	(D)	195
Ferrous metals and products.....	331-32,3398-99	289	17	272	(D)	(D)	19	(D)	(D)	77
Nonferrous metals and products.....	333-36	380	6	374	24	0	24	(D)	(D)	(S)
Fabricated metal products.....	34	(D)	(D)	920	(D)	(D)	(D)	(D)	(D)	160
Machinery.....	35	8,270	88	8,182	(D)	(D)	(D)	1,376	19	1,357
Office, computing, and accounting machines.....	357	4,811	33	4,778	(D)	(D)	75	(D)	(D)	794
Other machinery, except electrical.....	351-56,358-59	3,457	55	3,404	(D)	(D)	(D)	(D)	(D)	563
Electrical equipment.....	36	12,686	1,402	11,285	(D)	4	(D)	(D)	(D)	2,016
Radio and TV receiving equipment.....	365	(D)	(D)	84	(D)	0	(D)	(D)	(D)	11
Communication equipment.....	366	(D)	(D)	3,129	(D)	(D)	(D)	167	0	167
Electronic components.....	367	5,316	(S)	5,089	(D)	1	(D)	960	(S)	925
Other electrical equipment.....	361-64,369	(D)	(D)	2,983	(D)	(D)	(D)	(D)	(D)	913
Transportation equipment.....	37	27,501	10,438	17,063	(D)	246	(D)	1,822	839	983
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)	10,653	74	0	74	(D)	(D)	463
Other transportation equipment.....	373-75,379	(D)	(D)	165	(D)	0	(D)	(D)	(D)	7
Aircraft and missiles.....	372,376	15,615	9,369	6,246	(D)	246	(D)	1,318	805	513
Professional and scientific instruments.....	38	10,288	2,767	7,521	(D)	(D)	349	1,987	336	1,651
Scientific and mechanical measuring instruments.....	381-82	5,901	2,670	3,231	(D)	(D)	129	1,353	311	1,042
Optical, surgical, photographic, and other instruments.....	383-87	4,387	97	4,290	(D)	(D)	220	634	25	609
Other manufacturing industries.....	27,31,39	(D)	(D)	763	120	0	120	70	0	70
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	31,320	5,782	25,538	2,738	342	2,396	6,270	2,477	3,793

See explanatory information and SOURCE at end of table.

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**Table B-8. Funds for performance of basic research, applied research, and development, funds not distributed,
and percent of funds not distributed, by industry and source of funds: 1993**

Distribution by industry	SIC code	Development			Expenditures not distributed			Percent of expenditures not distributed		
		Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
[Dollars in millions]										
Total.....		\$77,502	\$16,393	\$61,109	\$11,515	\$637	\$10,878	9.7%	2.8%	11.4%
Food, kindred, and tobacco products.....	20,21	701	0	701	187	0	187	14.0	0.0	14.0
Textiles and apparel.....	22,23	(D)	(D)	143	(D)	(D)	88	32.8	71.4	30.6
Lumber, wood products, and furniture.....	24,25	(D)	(D)	130	(D)	(D)	26	10.3	0.0	10.5
Paper and allied products.....	26	442	0	442	187	0	187	(D)	(D)	14.9
Chemicals and allied products.....	28	(D)	(D)	7,696	(D)	(D)	1,654	9.1	0.0	9.9
Industrial chemicals.....	281-82,286	(D)	(D)	2,965	(D)	(D)	(S)	3.4	0.0	(S)
Drugs and medicines.....	283	(D)	(D)	3,429	1,266	0	1,266	13.8	0.0	13.9
Other chemicals.....	284-85,287-89	(D)	(D)	1,302	166	0	166	(D)	(D)	7.1
Petroleum refining and extraction.....	13,29	757	11	745	(D)	0	(D)	(D)	0.0	(D)
Rubber products.....	30	702	0	701	235	0	235	(D)	(D)	21.5
Stone, clay, and glass products.....	32	285	4	281	(D)	(D)	41	23.1	96.5	7.7
Primary metals.....	33	374	16	358	(S)	0	(S)	(S)	0.0	(S)
Ferrous metals and products.....	331-32,3398-99	(D)	(D)	147	(S)	0	(S)	(S)	0.0	(S)
Nonferrous metals and products.....	333-36	(D)	(D)	211	21	0	21	5.5	0.0	5.6
Fabricated metal products.....	34	674	203	471	218	0	218	(D)	(D)	23.7
Machinery.....	35	5,314	63	5,251	(D)	(D)	(S)	(D)	(D)	(S)
Office, computing, and accounting machines.....	357	3,169	28	3,141	(S)	0	(S)	(S)	0.0	(S)
Other machinery, except electrical.....	351-56,358-59	2,145	35	2,110	(D)	(D)	562	(D)	(D)	16.5
Electrical equipment.....	36	6,656	1,098	5,558	(D)	(D)	3,458	(D)	(D)	30.6
Radio and TV receiving equipment.....	365	(D)	(D)	59	(D)	0	(D)	(D)	(D)	(D)
Communication equipment.....	366	(D)	(D)	1,669	(D)	(D)	(D)	35.2	8.1	(D)
Electronic components.....	367	(D)	(D)	2,329	(D)	(D)	(D)	(D)	(D)	(D)
Other electrical equipment.....	361-64,369	(D)	(D)	1,502	(D)	(D)	464	12.7	0.2	15.6
Transportation equipment.....	37	24,060	8,954	15,106	1,252	(D)	(D)	4.5	(D)	(D)
Motor vehicles and motor vehicles equipment.....	371	(D)	(D)	10,071	45	0	45	(D)	(D)	0.4
Other transportation equipment.....	373-75,379	(D)	(D)	72	(D)	(D)	(D)	43.0	100.0	(D)
Aircraft and missiles.....	372,376	12,903	7,340	4,963	(D)	(D)	(D)	(D)	(D)	(D)
Professional and scientific instruments.....	38	7,170	2,407	4,763	(D)	(D)	(S)	(D)	(D)	10
Scientific and mechanical measuring instruments.....	381-82	4,127	2,341	1,786	(D)	(D)	(S)	(D)	(D)	8.5
Optical, surgical, photographic, and other instruments.....	383-87	(D)	(D)	2,977	(D)	(D)	(S)	(D)	(D)	11.3
Other manufacturing industries.....	27,31,39	(D)	(D)	433	140	0	140	(D)	(D)	18.3
Nonmanufacturing industries.....	07-10,12-17, 40-42,44-49, 50-59,60-65,67, 701,73,75-76, 78-79,80-81, 83-84,87,89	21,234	2,905	18,329	1,078	58	1,020	3.4	1.0	4.0

KEY: (D) = Data have been withheld to avoid disclosing operations of individual companies.
(S) = Data have been withheld because of imputation of more than 50 percent.

NOTE: The character-of-work estimation procedure was revised for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. See technical notes for a more complete discussion of this change.

SOURCE: National Science Foundation/SRS, Survey of Industrial Research and Development: 1993

COMPARABILITY OF STATISTICS

This section summarizes the statistical revisions that have been made because of changes in survey procedures and practices.¹³

CURRENT-YEAR CONSIDERATIONS

Revisions to Immediate Prior-Year Statistics

As has been the practice throughout the history of the survey, results from the current-year survey are used not only to develop current-year statistics, but also to revise immediate prior-year statistics. Differences between originally developed statistics and revised statistics occur for three reasons: industry shifts, data revisions, and the effects of a new sample design.

Industry shifts. The movement of a company from one industry into another can be caused by several factors, including changes in a company's payroll composition, which is used to determine the industry classification code (see earlier discussion under Frame Creation); changes in the industry classification system itself; and changes in the way the industry classification code is assigned or revised during survey processing. These are described below.

Payroll composition. A company's payroll composition may change because of a number of events. Among them are (1) the growth or decline of product or service lines; (2) the merger of two or more companies; (3) the acquisition of one company by another; (4) divestitures; and (5) the formation of conglomerates. When it is determined that a company's payroll composition—and therefore its industry classification—has changed, the company's data are reclassified into the new industry beginning in the year of the change.

Industry classification system. From time to time the standard industrial classification (SIC) coding system, which is used by most Federal Government agencies that publish industry statistics, is

revised to reflect the changing composition of U.S. industry. For statistics developed for 1988-91 from the 1988-91 surveys, companies retained the industry classifications assigned for the 1987 sample. These classifications were based on the 1977 SIC system. The last major revision of the SIC system was for 1987, so this new system was used to classify companies in the 1992 and 1993 surveys. Consequently, the 1993 statistics and revised 1992 statistics in this report were developed using the 1987 SIC system, and minor data shifts are attributable to the system change only when comparing current statistics with pre-1987 statistics. For example, the 1987 system expanded SIC 30, rubber products, to include a variety of specific plastic products that may have been classified elsewhere using the 1977 system.

Processing changes. In response to perceived changes in the amount and dispersion of R&D among industries and findings of various quality improvement initiatives and other research undertakings, the sponsor of the survey, in consultation with the compiling agent, from time to time seeks to improve the coverage of the survey by revising the method used to classify firms. Research has shown that there is no impact on the aggregated statistics because of these processing changes and the impact on individual industry estimates is minor.¹⁴ The current method used to classify firms is discussed earlier under Frame Creation. Methods used for past surveys are discussed in a technical paper.¹⁵ There was no change in the way firms were classified or in the way data were processed for the 1993 survey compared with the 1992 survey.

Data revisions. Changes to reported data can come from two sources: from respondents (see earlier discussion under Survey Questionnaires) and

¹³ See also the technical paper U.S. Department of Commerce, Bureau of the Census, *Design of the Survey of Industrial Research and Development: A Historical Perspective* (Washington, DC, 1995)

¹⁴ The effects of recent changes in the way companies are classified during survey processing are discussed in detail in a Bureau of the Census technical memoranda entitled *Reclassification of Companies in the 1992 Survey of Industrial Research and Development for the Generation of the Analytical Series*, Oct. 25, 1994, and *Comparison of Company Coding Between 1992 and 1993 for the Survey of Industrial Research and Development*, Nov. 3, 1994.

¹⁵ U.S. Department of Commerce, Bureau of the Census, *Design of the Survey of Industrial Research and Development: A Historical Perspective* (Washington, DC, 1995).

from analysts involved in survey and statistical processing. Respondents from companies that were in both the 1992 and 1993 surveys may have revised previously reported data for 1992. Analysts, while performing follow-up, may have corrected incorrectly reported or supplied missing 1992 data.

Effects of a New Sample Design.

Changes to the sample design can dramatically affect revisions to immediate prior-year estimates. The most profound influence on the revisions to the 1991 statistics was the new sample design for the 1992 survey (see *Research and Development in Industry: 1992* for a detailed discussion). The sample design used for the 1993 survey was the same design used for the 1992 survey so revisions to the original 1992 estimates were primarily because of industry shifts and data revisions.

Recent Survey Improvements¹⁶

Before the 1992 survey, the sample of firms surveyed was selected at irregular intervals.¹⁷ In intervening years, a panel of the largest firms known to perform R&D was surveyed. For example, a sample of about 14,000 firms was selected for the 1987 survey. For the 1988 through 1991 studies, about 1,700 of these firms were annually resurveyed; the other firms did not receive another questionnaire, and their R&D data were estimated. This sample design was adequate during the early years of the survey because the performance of R&D remained concentrated in the manufacturing industries. However, as more and more firms began entering the R&D-performing arena, the old sample design proved increasingly deficient because it did not capture births of new R&D-performing firms. The entry of fledgling R&D performers into the marketplace was simply missed during panel years. Additionally, beginning in the early 1970s, the need for more detailed R&D information for nonmanufacturers was recognized. At that time, statistics for the broad industry classifications miscellaneous business services and miscellaneous services were added to the list of industry groups for which statistics were

published. By 1975, about 3 percent of total R&D was performed by firms in nonmanufacturing industries.

During the mid-1980s, there was evidence that an increasing number of nonmanufacturing firms were conducting a significant amount of R&D, and again the number of industries used to develop the statistics for nonmanufacturers was increased. Consequently, the annual reports in this series for 1987 and since have included separate R&D estimates for firms in the communication, utility, engineering, architectural, research, development, testing, computer programming, and data processing service industries; hospitals; and medical labs. Approximately 9 percent of the estimated industrial R&D performance during 1987 was undertaken by nonmanufacturing firms.

After the list of industries for which statistics were published was expanded, it became clear that the sample design itself should be changed to reflect the widening population of R&D performers among firms in the nonmanufacturing industries¹⁸ and small firms in all industries, to account better for births of R&D performing firms and to produce statistics that are generally more reliable. Beginning with the 1992 survey, NSF decided to (1) draw new samples with broader coverage annually and (2) increase the sample size to approximately 23,000 firms.¹⁹ As a result of the sample redesign, for 1992, the reported nonmanufacturing share was estimated to be 25 percent of total R&D.

¹⁸ For the 1992 survey, 25 new nonmanufacturing industry and industry groups were added to the sample frame: agricultural services (SIC 07); fishing, hunting, and trapping (09); wholesale trade-nondurables (51); stationery and office supply stores (5112); industrial and personal service paper (5113); groceries and related products (514); chemicals and allied products (516); miscellaneous nondurable goods (519); home furniture, furnishings, and equipment stores (57); radio, TV, consumer electronics, and music stores (573); eating and drinking places (581); miscellaneous retail (59); nonstore retailers (596); real estate (65); holding and other investment offices (67); hotels, rooming houses, camps, and other lodging places (70); automotive repair, services, and parking (75); miscellaneous repair services (76); amusement and recreation services (79); health services (80); offices and clinics of medical doctors (801); offices and clinics of other health practitioners (804); miscellaneous health and allied services not elsewhere classified (809); engineering, accounting, research, management, and related services (87); and management and public relations services (874).

¹⁹ Annual sampling also remedies the cyclical deterioration of the statistics that results from changes in a company's payroll composition because of product line and corporate structural changes.

¹⁶ See also National Science Foundation, *SRS Data Brief*, 1992 R&D Spending by U.S. Firms Rises, NSF Survey Improved (NSF 94-325), (Arlington, VA, Sept. 9, 1994).

¹⁷ During the early years of the survey, until 1967, samples were selected every 5 years. Subsequent samples were selected for 1971, 1976, 1981, and 1987.

Time Series Analyses

As discussed earlier, the statistics resulting from the survey are better indicators of changes in, rather than absolute levels of, R&D spending and personnel. Nevertheless, the statistics are often considered as a continuous time series that has been prepared using the same collection, processing, and tabulation methods. Such uniformity during preparation has not been the case. Since the survey was first fielded, improvements have been made to increase the reliability of the statistics and to make the survey results more useful. To that end, existing practices have been changed and new procedures have been instituted. Preservation of the comparability of the statistics has been an important consideration when improvements have been made, however. Changes to survey definitions, the industry classification system, and the procedure used to assign industry codes to multi-establishment companies²⁰ have had some, though not substantial, effects on the comparability of statistics.²¹ The aspect of the survey that had a greater effect on comparability was the selection of samples at irregular intervals (i.e., 1967, 1971, 1976, 1981, 1987, 1992) and the use of a subset or panel of the last sample drawn to develop statistics for intervening years. As discussed earlier, this practice introduced cyclical deterioration of the statistics.

As compensation for this deterioration, periodic revisions have been made to the statistics produced from the panels surveyed between sample years. Early in the survey's history, various methods were used to make these revisions.²² Since 1976, a linking procedure called wedging has been used.²³ Simply

described, in wedging, the two sample years on each end of a series of estimates serve as benchmarks in the algorithms used to adjust the estimates for the intervening years.

Wedging Methodology

For a full discussion of the mathematical algorithm used for the wedging process that linked statistics from the 1992 survey with those from the 1987 survey, see the technical memorandum cited below.²⁴ In general, the memorandum states that wedging—

takes full advantage of the fact that in the first year of a new panel [when a new sample is selected], both current-year and prior-year estimates are derived. Thus, two independent estimates exist for the prior year. The estimates from the new panel are treated as superior primarily because the new panel is based on updated classifications [the industry classifications in the prior panel are frozen] and is more fully representative of the current universe (the prior panel suffers from panel deterioration, especially a lack of birth updating). The limitations in the prior panel caused by these factors are naturally assumed to increase with time, so that in the revised series, we desire a gradual increase in the level or revision over time which culminates in the real difference observed between the two independent sample estimates of the prior year. At the same time, we desire that the annual movement of the original series be preserved to the degree possible in the revised series.

²⁰ For discussions of each of these, see the Bureau of the Census technical memorandum entitled *Wedging Considerations for the 1992 Research and Development (R&D) Survey*, June 10, 1994.

²¹ See the Bureau of the Census technical memoranda entitled *Reclassification of Companies in the 1992 Survey of Industrial Research and Development (R&D) for the Generation of the Analytical Series*, Oct. 25, 1994, and *Effects of the 1987 SIC Revision on Company Classification in the Survey of Industrial Research and Development (R&D)*, Dec. 6, 1993.

²² See U.S. Department of Commerce, Bureau of the Census, *Survey Design of the Survey of Industrial Research and Development: A Historical Perspective* (Washington, DC, 1995).

²³ The process was dubbed wedging because of the wedgelike area produced on a graph that compares originally reported statistics with the revised statistics that result after linking.

To that end, the wedging algorithm does not change estimates from sample years and adjusts estimates from panel years, recognizing that deterioration of the panel is progressive over time.

Wedged Versus Not-Wedged Statistics

One of the primary reasons for the decision to select a new sample annually rather than at irregular intervals was to avoid the necessity to apply global revision processes such as wedging. Consequently, the 1992 survey was intended to be the last one to employ the wedging procedure.

²⁴ Bureau of the Census technical memorandum, *Wedging Considerations for the 1992 Research and Development (R&D) Survey*, June 10, 1994.

REVISIONS TO HISTORICAL STATISTICS

Throughout the history of the survey, during regular survey processing, all immediate prior-year statistics have been subject to revision with results from the current year's survey. Changes to older statistics, however, usually have been limited to revisions because of changes in the industry classification of companies caused by changes in payroll composition detected when a new sample was drawn. Various

methodologies have been adopted over the years to revise, or backcast, the data when revisions to historical statistics have become necessary.

Documented revisions to the historical statistics from post-1967 surveys are summarized in *Research and Development in Industry: 1991* (NSF 94-325). Detailed descriptions of the specific revisions made to the statistics from pre-1967 surveys are scarce. However, summaries of some of the major revisions are included in the technical paper cited below.²⁵

²⁵ U.S. Department of Commerce, Bureau of the Census, *Survey Design of the Survey of Industrial Research and Development: A Historical Perspective* (Washington, DC, 1995).

SURVEY DEFINITIONS

COST PER R&D SCIENTIST OR ENGINEER

The arithmetic mean of the numbers of full-time equivalent (FTE) scientists and engineers engaged in the performance of R&D reported for January in two consecutive years divided into the total R&D expenditures of the earlier year, with the ratio attributed to the earlier year. For example, the mean of the numbers of FTE R&D scientists and engineers in January 1992 and January 1993 is divided into total 1992 R&D expenditures for a total cost per R&D scientist or engineer in 1992.

EMPLOYMENT, FTE R&D SCIENTISTS AND ENGINEERS

Persons employed by the company during the January following the survey year who are engaged in scientific or engineering work at a level that requires knowledge of physical, life, engineering, or mathematical science equivalent at least to that acquired through completion of a 4-year college program with a major in one of those fields. The statistics in this

report show the FTE employment. The FTE is the number of scientists and engineers in the company who are assigned full time to R&D projects plus the number of non-full-time R&D scientists and engineers prorated according to the fraction of their total work time spent on R&D projects.

EMPLOYMENT, TOTAL

Number of persons domestically employed by R&D-performing companies in all activities during the pay period that includes the 12th of March.

Federally Funded R&D Centers (FFRDCs)

R&D-performing organizations administered by industrial, educational, or other institutions on a nonprofit basis, exclusively or substantially financed by the Federal Government. R&D expenditures of the FFRDCs that are industry administered are included with the Federal R&D data of the industry classification of each of the administering firms. The industry-administered FFRDCs included in the 1993 survey are listed as follows.

FFRDCs Supported by the Department of Energy:

Bettis Atomic Power Laboratory
Westinghouse Electric Corp.
West Mifflin, PA

Energy Technology Engineering Center
Rockwell International Corp.
Canoga Park, CA

Hanford Engineering Development Laboratory
Westinghouse-Hanford Corp.
Richland, WA

Idaho National Engineering Laboratory
EG&G Idaho, Inc.;
Westinghouse Electric Corp.
Argonne National Laboratory, West;
Rockwell International Corp.;
Idaho Falls, ID

Knolls Atomic Power Laboratory
General Electric Co.
Schenectady, NY

Oak Ridge National Laboratory
Martin Marietta Energy Systems, Inc.
Oak Ridge, TN

Sandia National Laboratories
Western Electric Co., Inc.-Sandia Corp.
Albuquerque, NM

Savannah River Laboratory
Westinghouse Electric Corp.
Aiken, SC

FFRDCs Supported by the National Institutes of Health, Department of Health and Human Services:

NCI Frederick Cancer Research Facility
Program Resources, Inc.
Frederick, MD

FUNDS FOR R&D, COMPANY (AND OTHER)

Cost of R&D actually performed within the company and funded by the company itself or by other

non-Federal sources by contract, not including the cost of R&D supported by companies but contracted to outside organizations such as research institutions, universities and colleges, nonprofit organizations, or (to avoid double-counting) other companies.

FUNDS FOR R&D, FEDERAL.

Receipts for R&D performed by the company under Federal R&D contracts or subcontracts and R&D portions of Federal procurement contracts and subcontracts.

FUNDS FOR R&D, TOTAL.

Operating expenses incurred by a company in the conduct of R&D in its own laboratories or other company-owned or -operated facilities including wages and salaries, materials and supplies, property and other taxes, maintenance and repairs, depreciation, and an appropriate share of overhead, not including capital expenditures.

NET SALES AND RECEIPTS.

Dollar values for goods sold or services rendered by R&D-performing companies to customers (outside the company), including the Federal Government, less such items as returns, allowances, freight, charges, and excise taxes. (Domestic intracompany transfers and sales by foreign subsidiaries are excluded, but transfers to foreign subsidiaries and export sales to foreign companies are included.)

RESEARCH AND DEVELOPMENT.

Basic and applied research in the sciences and engineering and the design and development of prototypes and processes, excluding quality control, routine product testing, market research, sales promotion, sales service, other nontechnological activities or routine technical services, and research in the social sciences or psychology.

Basic research.

Original investigations for the advancement of scientific knowledge not having specific immediate commercial objectives, although such investigations may be in fields of present or potential interest to the reporting company.

Applied research.

Investigations for the discovery of new scientific knowledge having specific commercial objectives with respect to products or processes. (Applied research differs from basic research chiefly in terms of the objectives of the reporting company.)

Development.

Technical activities not routine in nature concerned with translating research findings or other scientific knowledge into products or processes. Not included are routine technical services to customers or other activities excluded above.

SECTION C. SURVEY DOCUMENTS

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OFFICE OF THE
DIRECTOR

NATIONAL SCIENCE FOUNDATION

4201 WILSON BOULEVARD
ARLINGTON, VIRGINIA 22230

**FROM THE DIRECTOR
NATIONAL SCIENCE FOUNDATION**

The National Science Foundation requests your company's participation in its 1993 Survey of Industrial Research and Development. This annual survey is the only source of detailed information on U.S. industry's research and development (R&D) performance.

Your company's participation is vital to the accuracy of the resulting information. Because R&D expenditures are concentrated in relatively few companies, a completed response is needed from each surveyed firm – there is no good substitute for the information that you can provide. Your company can be assured of complete confidentiality. Survey data will be released only in aggregate form so that responses of individual companies cannot be identified.

Survey results will be made available to government and industry officials, researchers, and other interested individuals. If you have questions concerning the operation of this survey, please direct them to the Census Bureau's Innovation and Technology Branch on (301) 763-5598. If you would like to receive a copy of the final publication or if you need to speak with someone at NSF, please call Jennifer Gray in the Division of Science Resources Studies on (703) 306-1772.

Sincerely,

Neal Lane
Director

Enclosures



FROM THE ACTING DIRECTOR
BUREAU OF THE CENSUS

The Bureau of the Census conducts the "Survey of Industrial Research and Development" under sponsorship of the National Science Foundation (NSF). Data on research and development expenditures are essential to policymakers in analyzing and forecasting long-term economic growth and formulating policy recommendations.

We request your cooperation in completing the report form for 1993. The 1993 report should cover your entire domestic company operations. We also enclose the instructions for completing the report form and a letter from the NSF emphasizing the survey's prominence.

The law (Title 13, United States Code) authorizes this report. Your response is mandatory for Items 1A and 1B and Item 3A.3, Columns 4 and 6. We need your cooperation in reporting the remaining items to make the results of the survey comprehensive and accurate. We recognize you may not maintain book records for particular items. In such cases, please use carefully prepared estimates.

By Section 9 of the same law (Title 13), your report to the Bureau of the Census is confidential. Only sworn Bureau of the Census employees will see the information you reported, and they will use it only for statistical purposes. Copies retained in your files are immune from legal process.

Please return the completed form within 60 days. If you have questions concerning this survey, need copies of the form, or need a time extension, please call the Technology and Innovation Branch of our Industry Division on (301) 763-5598. We thank you for your continued cooperation in this vital survey.

Sincerely,

A handwritten signature in cursive script, reading "Harry A. Scarr".

Harry A. Scarr

Enclosures

NOTICE - Your report to the Census Bureau is confidential by law (Title 13, U.S. Code). It may be seen only by sworn Census employees and may be used only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.		CENSUS USE ONLY		FORM RD-1(L) (1-25-84)	U.S. DEPARTMENT OF COMMERCE BUREAU OF THE CENSUS COLLECTING AND COMPILING ASSISTANT FOR THE NATIONAL SCIENCE FOUNDATION
RETURN TO Bureau of the Census 1201 East 10th Street Jeffersonville, IN 47132-0001		SURVEY CODE 4001	SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1993		
Name of person who supplied 1992 data		INDUSTRY CODE	In correspondence pertaining to this report refer to this CENSUS FILE NUMBER (11 digits)		
Data supplied in items 1A and 1B and in item 3A, line 3, columns 4 and 6, for 1993 on this form will satisfy the mandatory reporting requirements. (Title 13, U.S. Code.)		WEIGHT	(Please correct any error in name and address, including ZIP Code.)		
PLEASE READ ENCLOSED INSTRUCTIONS BEFORE COMPLETING THIS FORM.		STATE			
		ADDRESS			
		SIC CODE			

GENERAL INSTRUCTIONS

Please complete this form and return within 90 days in the envelope provided. Make a copy for your records.

THIS REPORT SHOULD COVER YOUR ENTIRE COMPANY, INCLUDING ALL SUBSIDIARIES.

- The phrase **performed within the company** includes the activities of domestic subsidiaries.
- The phrase **foreign subsidiaries** is defined as those subsidiaries located outside of the 50 States and the District of Columbia.

Enter 0 (zero) where appropriate rather than leaving an item blank.

Figures for 1992 are those reported by your company last year. THE FIGURES SHOULD BE REVISED, IF NECESSARY, TO BE COMPARABLE TO 1993 DATA.

Explain any substantial increase or decrease in 1993 figures over 1992 in the "Remarks" section on the back page.

Please report figures in thousands of dollars. Reasonably accurate estimates are acceptable.

Section I - GENERAL COMPANY DATA

Item 1 - SALES AND EMPLOYMENT FOR THE COMPANY

A. Domestic net sales and receipts of the company

INCLUDE sales of products and services to other companies, individuals, U.S. Government agencies, and foreign countries.

EXCLUDE domestic intra-company transfers and sales by foreign subsidiaries.

Domestic net sales and receipts of this company
(Report in thousands of dollars)

1992			1993		
Bill.	Mill.	Thou.	Bill.	Mill.	Thou.
101			102		

B. Total domestic company employment in all activities during the pay period which includes the 12th of March 1993 (Item 1 of U.S. Form 941, if one Form 941 was filed for the entire company.)

1992		1993	
Number		Number	
111		112	

Item 2 - NUMBER OF RESEARCH AND DEVELOPMENT SCIENTISTS AND ENGINEERS
Apportion on a full-time equivalent basis. See page 4 of the instruction booklet for more detail.

A. Federal research and development

January 1993		January 1994	
Number		Number	
200		204	

B. Company and other research and development

205		208	
-----	--	-----	--

C. TOTAL - Sum of lines 2A and 2B

201		202	
-----	--	-----	--

Item 3 - REPORT COSTS INCURRED FOR RESEARCH AND DEVELOPMENT

(Report in thousands of dollars)

	1992									1993								
	Federal funds (1)			Company and other (2)			Total (1)+(2) (3)			Federal funds (4)			Company and other (5)			Total (4)+(5) (6)		
	Bill.	Mill.	Thou.	Bill.	Mill.	Thou.	Bill.	Mill.	Thou.	Bill.	Mill.	Thou.	Bill.	Mill.	Thou.	Bill.	Mill.	Thou.
A. Within the company																		
1. Basic research - If "NONE," please mark (X) here and enter 0 (zero) where appropriate. →	301			302			303			304			305			306		
2. Applied research																		
a. Applied research	311			312			313			314			315			316		
b. Development	321			322			323			324			325			326		
c. Total - Sum of lines a and b	331			332			333			334			335			336		
3. Total - Sum of lines 1 and 2c.	341			342			343			344			345			346		
B. Outside the company - Total company funds for research and development activities financed by the company but performed by others outside the company within the United States (Should be excluded from 3.A.3. above)				352									355					
C. Foreign - Total company funds for research and development activities performed by foreign subsidiaries or by other organizations outside the United States (Should be excluded from 3.A.3. and 3.B. above)				362									365					
D. TOTAL - Company and other funds, except Federal - Sum of lines 3.A.3., 3.B., and 3.C. →				372									375					

Item 4 - COMPANY AND OTHER FUNDS, EXCEPT FEDERAL, FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BUDGETED FOR THE YEAR 1994

1994		
Bill.	Mill.	Thou.
401		

(Comparable to the 1993 figure reported in item 3.A.3., column (6).)

Section II - RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE DOMESTIC COMPANY

Item 5 - COSTS INCURRED FOR FEDERAL RESEARCH AND DEVELOPMENT PERFORMED WITHIN THIS COMPANY BY PRINCIPAL GOVERNMENT AGENCY

Allocate the total reported in item 3.A., line 2, column (6), Federal funds, into the following principal agencies:

1. Department of Defense

2. National Aeronautics and Space Administration

3. Department of Energy

4. Other Federal agencies

5. TOTAL COSTS - Sum of lines 1 through 4

Key code	1991 (1)			1992	1993 (2)		
	Bill.	Mill.	Thou.		Bill.	Mill.	Thou.
01				0			
02				1			
03				2			
04				3			
05				4			

Item 6 - COSTS INCURRED FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THIS COMPANY BY MAJOR TYPE OF EXPENSE

Allocate the total reported in item 3.A., line 2, column (6), total company research and development - Exclude lines 3.A. and 3.C.

1. Wages and salaries of research and development personnel - Include scientists and engineers, technicians, accountants, and other personnel.

2. Costs of materials and supplies consumed - Do not include in this item components, models, and other materials supplied by other research organizations.

3. Other costs - Include service and supporting costs, R&D depreciation, and share of overhead.

4. TOTAL COSTS - Sum of lines 1 through 3

Key code	1991 (1)			1992	1993 (2)		
	Bill.	Mill.	Thou.		Bill.	Mill.	Thou.
01				0			
02				1			
03				2			
04				3			

SURVEY OF INDUSTRIAL RESEARCH
AND DEVELOPMENT DURING 1993U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS
COLLECTING AND COMPILING AGENT FOR
THE NATIONAL SCIENCE FOUNDATIONRefer to this CENSUS
FILE NUMBER in any
correspondence
pertaining to this report

Page 2

Section II RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE DOMESTIC COMPANY - Continued

Item 7 - FIELDS OF BASIC RESEARCH PERFORMED WITHIN THIS COMPANY

Allocate the total reported in item 3.A, line 1, column (B), basic research, into the following fields of science and engineering.

Key code	1991 (1)	1992	1993 (2)
	Bi. Mil. Thou.	Bi. Mil. Thou.	Bi. Mil. Thou.
01			
02			
03			
04			
05			
06			
07			
08			
09			
10			
11			
12			
13			

Item 8 - APPLIED RESEARCH AND DEVELOPMENT BY PRODUCT CLASS PERFORMED WITHIN THIS COMPANY

Allocate the totals reported as applied research and development in item 3.A, line 2, column (A) and (B), into the following product groups and funding sources. These product groups represent the END PRODUCT for the firm. See page 7 of the instruction booklet for detailed descriptions of product classes.

No.	SIC Group	Product class	Key code	1991				1992	1993			
				Bi.	Mil.	Thou.	Total funds (2)		Bi.	Mil.	Thou.	Total funds (2)
1	20	Food and kindred products	01									
2	22	Textile mill products	02									
3	24	Lumber and wood products	03									
4	26	Paper and allied products	04									
5	281, 286	Industrial inorganic and organic chemicals	05									
6	282	Plastics materials and synthetic resins, rubber, and fiber	06									
7	283	Drugs	07									
8	287	Agricultural chemicals	08									
9	Balance of SIC 28 group	Cleaning supplies, toiletries, and paints	09									
10	29, 13	Petroleum refining, and oil and gas extraction	10									
11	30	Rubber and miscellaneous plastics products	11									
12	31	Leather	12									
13	32	Stone, clay, glass, and concrete products	13									
14	331, 332, 3399	Primary ferrous products	14									
15	Balance of SIC 33 group	Primary and secondary nonferrous metals	15									
16	348	Ordinance, except missiles	16									
17	Balance of 34	Fabricated metal products	17									
18	351	Engines and turbines	18									
19	352	Farm machinery and equipment	19									
20	353	Construction, mining, and materials handling machinery	20									
21	354	Metal working machinery and equipment	21									
22	357	Office, computing, and accounting machines	22									
23	Balance of SIC 35 group	Other machinery, except electrical	23									
24	361	Electric transmission and distribution equipment	24									
25	362	Electrical industrial apparatus	25									
26	366	Radio and television receiving sets, except communication types	26									
27	368	Communications equipment	27									
28	367	Electronic components and accessories	28									
29	Balance of SIC 36 group	Other electrical machinery equipment and supplies	29									
30	371	Motor vehicles and equipment	30									
31	372	Aircraft and parts	31									
32	378	Machines and space vehicles	32									
33	Balance of SIC 37 group	Other transportation equipment	33									
34	381, 2	Scientific and mechanical measuring instruments	34									
35	Balance of SIC 38 group	Optical, surgical, photographic, and other instruments	35									
36	737	Software	36									
37		Other - Specify	37									
38			38									

Item 9 - COST OF RESEARCH AND DEVELOPMENT PERFORMED WITHIN THIS COMPANY, BY STATE

Allocate the total reported in item 3.A, line 3, column (A) and (B), by the States in which your various research and development laboratories or facilities are located. Estimate the costs associated with each State if necessary, you may report up to 10 percent of your total as "Not distributed by State."

Key code	State	1991				1992	1993				Key code	State	1991				1992	1993			
		Federal funds (1)	Total funds (2)	Bi.	Mil. Thou.		Federal funds (1)	Total funds (2)	Bi.	Mil. Thou.			Federal funds (1)	Total funds (2)	Bi.	Mil. Thou.		Federal funds (1)	Total funds (2)	Bi.	Mil. Thou.
01	AL											27	MT								
02	AK											28	NE								
03	AZ											29	NV								
04	AR											30	NH								
05	CA											31	NJ								
06	CO											32	NM								
07	CT											33	NY								
08	DE											34	NC								
09	DC											35	ND								
10	FL											36	OH								
11	GA											37	OK								
12	HI											38	OR								
13	ID											39	PA								
14	IL											40	RI								
15	IN											41	SC								
16	IA											42	SD								
17	KS											43	TN								
18	KY											44	TX								
19	LA											45	UT								
20	ME											46	VT								
21	MD											47	VA								
22	MA											48	WA								
23	MI											49	WV								
24	MN											50	WI								
25	MS											51	WY								
26	MO											52	"								
53												53									
54												54									

10 TOTAL COSTS - Sum of lines 1 through 52

*Not distributed by State

PLEASE CONTINUE ON NEXT PAGE

SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1993

Section II - RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE DOMESTIC COMPANY - Continued

Item 10 - ENERGY RESEARCH AND DEVELOPMENT PERFORMED WITHIN THIS COMPANY

• Report expenditures for energy research and development by type of energy sources. Include the project cost or portion of project cost incurred for the purpose of increasing energy resources or capabilities. These expenditures should be included in item 3.A., line 3, columns (4) and (6).

• Estimate expenditures for energy research by energy source for 1994.

Key code	10	1992						1993						1994					
		Federal funds			Total funds			Federal funds			Total funds			Projected Federal funds			Projected total funds		
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)		
		Bil.	Mil.	Thou.	Bil.	Mil.	Thou.	Bil.	Mil.	Thou.	Bil.	Mil.	Thou.	Bil.	Mil.	Thou.	Bil.	Mil.	Thou.
A. Nuclear	01																		
1. Fission	02																		
2. Fusion	03																		
3. Total	04																		
B. Fossil fuels	05																		
1. Oil	06																		
2. Gas	07																		
3. Shale	08																		
4. Coal	09																		
a. Synthetic fuels	10																		
b. Mining	11																		
c. All other	12																		
d. Total coal	13																		
5. Other fossil fuels	14																		
6. Total	15																		
C. Geothermal, solar, conservation and utilization	16																		
1. Geothermal	17																		
2. Solar	18																		
3. Conservation and utilization	19																		
4. Total	20																		
D. All other energy	21																		
E. TOTAL - Sum of lines A through D	22																		

Item 11 - POLLUTION ABATEMENT RESEARCH AND DEVELOPMENT PERFORMED WITHIN THIS COMPANY

• Report expenditures for pollution abatement by the form of pollution to be abated. Include the project cost or portion of the project cost incurred for the purpose of designing pollution abatement products or product characteristics or of designing pollution abatement features into processes. These expenditures should be included in item 3.A., line 3, columns (4) and (6).

• Estimate expenditures for pollution abatement research for 1994.

Key code	11	1992						1993						1994					
		Federal funds			Total funds			Federal funds			Total funds			Projected Federal funds			Projected total funds		
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)		
		Bil.	Mil.	Thou.	Bil.	Mil.	Thou.	Bil.	Mil.	Thou.	Bil.	Mil.	Thou.	Bil.	Mil.	Thou.	Bil.	Mil.	Thou.
A. Air	01																		
1. Automotive emissions	02																		
2. Electric power plant emissions	03																		
3. All other	04																		
4. Total air	05																		
B. Water	06																		
C. Solid waste	07																		
D. Other	08																		
E. TOTAL - Sum of lines A through D	09																		

Section III - RESEARCH AND DEVELOPMENT PERFORMED OUTSIDE THE DOMESTIC COMPANY WITH COMPANY FUNDS

Item 12 - FOREIGN RESEARCH AND DEVELOPMENT BY COUNTRY AND EXPENDITURE

Report the amount of total foreign research and development, item 3.C., column (5), for the countries with the largest expenditures. If necessary, write in countries not listed. Report the balance of foreign research and development on line 9.

Key code	12	1993		
		Bil.	Mil.	Thou.
1. Canada	01			
2. Germany	02			
3. France	03			
4. Japan	04			
5. United Kingdom	05			
6. Other - Specify	06			
7. Other - Specify	07			
8. Other - Specify	08			
9. Balance not distributed	09			
10. TOTAL - Sum of lines 1 through 9	10			

Item 13 - COVERAGE AND OPERATIONAL STATUS

A. Are research and development expenditures for entire domestic company, including subsidiaries, reported on this form?

1301 ☐ Yes

1302 ☐ No - Please explain in the "Remarks" section on the back of the page.

B. Was this company owned or controlled by another company on December 31, 1993?

1303 ☐ Yes - Complete 13.C. Date acquired: Month ____ Year ____

1304 ☐ No

C. New owner information

802 Name

803 Address (Number and street)

804 City

805 State

806 ZIP Code

Item 14 - CERTIFICATION - This report is substantially accurate and has been prepared in accordance with instructions

Name of person to contact regarding this report

Telephone

Area code

Number

Extension

Signature of authorized official

Title

Date

INSTRUCTIONS FOR SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1993 FORM RD-1L

Outline of Instructions

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GENERAL INSTRUCTIONS

Please complete and return this form in the envelope provided within 60 days. Make a copy for your records.

INTRODUCTION - Comprehensive and timely information about the nature and support of corporate research and development activities is an important component in the overall assessment of our nation's scientific and technological resources. The information you provide is used to prepare national measures of industrial research and development (R&D) not available from any other source. By carefully completing this report, the accuracy of this information is ensured.

SURVEY SCOPE - This report covers privately-owned nonfarm business firms in all sectors of the United States Economy. It does not include operations owned by Federal, State or local governments, or nonprofit organizations.

If your company is a nonprofit organization, please indicate so in the remarks section, page 4, and return the form.

If this form has been directed to a trust or pension plan which performs no activity other than investments, do not report. Please note in remarks section, page 4, and return the form.

REPORTING ENTITY - Report R&D for all domestic operations of your company, including subsidiaries and divisions. Report for all parts of the company that are located in the 50 States and the District of Columbia. Report sales and employment figures for all parts of the company, even those that do not perform R&D, as long as they are located in the 50 States or the District of Columbia.

If this form has been directed to a holding company, report for all subsidiaries and operations under the ownership and control of the holding company.

Companies Reporting in Survey for the First Time - Companies which did not report in the 1992 survey are asked to provide figures for both 1992 and 1993. If the company had no R&D expenditures, complete only Item 1. Enter "No R&D" in the "Remarks" section, sign, and return the form.

Figures for Earlier Years are Preposted on the Form - If your company reported for 1992, entries from that form have been copied on the present form. Please describe in the "Remarks" section (page 4 of the form) the reasons for any substantial increase or decrease in the 1993 figures entered on this form when compared to corresponding 1992 figures. Examples of such reasons are new government contracts, acquisitions and divestitures, revised accounting method, etc. If you acquired or disposed of a unit performing an important amount of research and development during the 2-year period, please identify the unit in "Remarks," and give the total amount of R&D accounted for by such unit.

Revision of Earlier Year Figures - If your company reported for 1992, entries from that form are pre-printed on the current form. Please revise the 1992 figures to be comparable with 1993 data and explain in the "Remarks" section any significant revisions made.

ESTIMATES ARE ACCEPTABLE - If you cannot answer a question from your company records, please estimate the answer carefully.

HOW TO REPORT - Report all value figures in thousands of dollars.

Example: 1,123,678,599 dollars.

	Bil.	Mil.	Thou.	Dol.
Report	\$1	124	679	000

If you estimate your answers in millions of dollars, please fill the thousands box with zeros.

Example: 1,124 million dollars.

	Bil.	Mil.	Thou.	Dol.
Report	\$1	124	000	000

PERIOD COVERED BY THE REPORT - Figures should be reported on a calendar year basis. Fiscal year data are acceptable for all items except for employment, provided your fiscal year ends between September and March. Please report employment figures (Items 1B and 2) for the specific time indicated for both of these items. Enter "0" where appropriate rather than leaving a blank space.

ADDITIONAL FORMS - Photocopies of this form are acceptable. If you require additional forms, write to the Bureau of the Census, 1201 East 10th Street, Jeffersonville, IN 47132-0001 or call (812) 288-3331.

FILING EXTENSIONS - If you cannot complete the survey in 60 days, request an extension of time by writing to the address below (please include your Census File Number):

Bureau of the Census
1201 East 10th Street
Jeffersonville, IN 47132-0001

or call: (812) 288-3331.

ALTERNATIVE REPORTING FORMATS - For information concerning use of reporting formats other than the form provided, such as computer tape, diskette, or printouts, contact Mr. Jesse Havard on (301) 763-5915.

BURDEN HOUR ESTIMATE - Public reporting burden for this collection of information is estimated to average 20 hours per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimates or any other aspects of this collection of information including suggestions for reducing this burden to Herman G. Fleming, National Science Foundation 4201 Wilson Boulevard, Arlington, VA 22230; and to the Office of Information and Regulatory Affairs, Office of Management and Budget (OMB No. 3145-0027), Washington, DC 20503.

Direct **QUESTIONS** regarding this form to the Bureau of the Census, ATTN: Industry Division, Washington, DC 20233-0001, or call (301)763-5598.

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DEFINITION OF RESEARCH AND DEVELOPMENT

R&D includes basic research and applied research in the sciences and in engineering, and design and development prototype products and processes.

For the purposes of this study, R&D includes activities carried on by persons trained, either formally or by experience, in the physical sciences including related engineering, and the biological sciences including medicine but excluding psychology, if the purpose of such activity is to do one or more of the following things:

1. Pursue a planned search for new knowledge, whether or not the search has reference to a specific application.
2. Apply existing knowledge to problems involved in the creation of a new product or process, including work required to evaluate possible uses.
3. Apply existing knowledge to problems involved in the improvement of a present product or process.

Research and development includes the activities described above whether assigned to separate R&D organizational units of the company or carried out by company laboratories and technical groups not part of an R&D organization. Reporting the R&D activities of such latter groups may require the use of estimates for some of the questions.

Activities to be excluded from R&D:

- Routine product testing
- Research in social sciences or psychology
- Geological and geophysical exploration activities
- Technical services such as:
- Quality and quantity control
- Technical plant sanitation control
- Trouble-shooting in connection with breakdowns in full-scale production
- Advertising programs to promote or demonstrate new products or processes
- Assistance in preparation of speeches and publications for persons not engaged in research and development.
- Social Science R&D – Social Science R&D is defined to encompass those activities devoted to further understanding the behavior of groups of human beings or of individuals as members of groups. Some of the topics include the following:
 - Personnel R&D
 - Economic R&D
 - Artificial intelligence and expert systems R&D
 - Consumer, market, and opinion R&D
 - Engineering psychology R&D
 - Management and organization R&D
 - Actuarial and demographic R&D
 - Educational processes and applications R&D
 - R&D in law
 - Software development

SPECIFIC INSTRUCTIONS

Section 1 – GENERAL COMPANY DATA

Item 1 – SALES AND EMPLOYMENT FOR THE COMPANY

Item 1A – Domestic Net Sales and Receipts

Sales and receipts are defined as the revenue for goods produced, distributed, or services provided. Include revenue from investments, rents, and royalties only if it is the principal business of the company. The reported figures should represent net value f.o.b. plant after discount and allowances and should exclude freight charges and excise taxes.

Include:

- All operating receipts from taxable operations, as well as total revenue from tax-exempt activities
- Sales of products and services to other companies, individuals, U.S. Government agencies, and foreign countries
- Transfers to foreign subsidiaries

Exclude:

- Domestic intra-company transfers
- Sales by foreign subsidiaries

Item 1B – Domestic Employment

Report the number of employees of the company in all activities in the 50 States and the District of Columbia during the pay period which includes March 12, 1993. This figure would be the same as Item 1 of Treasury Form 941, if one Form 941 was filed for the entire company. Report number of employees, not payroll.

Item 2 – NUMBER OF RESEARCH AND DEVELOPMENT SCIENTISTS AND ENGINEERS

Scientists and engineers are defined for this survey as all persons engaged in scientific or engineering work at a level which requires a knowledge of physical or life sciences or engineering or mathematics equivalent to completion of a 4-year college course with a major in these fields, regardless of whether or not they actually hold a degree in this field.

The figure on R&D scientists and engineers will be obtained primarily from two sources:

1. For company laboratories performing only research and development, report the number of scientists and engineers on the rolls in January.
2. For employees whose activities are not solely devoted to R&D, report the proportion of their time that is devoted to R&D. For example, if a company had the full-time equivalent of 60 scientists and engineers in January 1994 and one-fourth of their time was charged to R&D projects, the figure for the number of R&D scientists and engineers for this company would be 15.

Item 3 - REPORT COSTS INCURRED FOR RESEARCH AND DEVELOPMENT

Include as costs:

- Wages, salaries, and related costs
- Materials and supplies consumed
- R&D depreciation
- Cost of computer software used in R&D activities
- Utilities, such as telephone, telex, electricity, water, and gas
 - Travel costs and professional dues
 - Property taxes and other taxes (except income taxes) incurred on account of the R&D organization or the facilities they use
 - Insurance expenses
 - Maintenance and repair, including maintenance of buildings and grounds
 - Company overhead including: personnel, accounting, procurement and inventory, and salaries of research executives not on the payroll of the R&D organization

Exclude as costs:

- R&D performed abroad (outside the Continental U.S.) such as in Canada and Puerto Rico (Except in Item 3.C.)
- R&D performed by non-company R&D organizations of any kind (Except in Item 3.B.)
- Capital expenditures
- Patent expense
- Income taxes and interest
- The portion of company-held R&D contracts that were subcontracted outside the reporting company
- Fellowships, grants, and gifts to promote R&D or the study of science and engineering
- Social Science R&D

Item 3.A - Report Costs Incurred for Research and Development Performed Within the Company

Federally sponsored R&D performed within the company should be reported in column 4.

Costs of company sponsored R&D performed within the company, or R&D performed within the company under contract from non-federal sources should be reported in column 5.

Costs of INDEPENDENT R&D should also be reported in column 5. For the purpose of this survey, INDEPENDENT R&D is defined as R&D performed by the company for which you anticipate reimbursement by the government through indirect charges for the purchase of products or services.

Types of Research

Item 3.A.1 - Basic Research

Include the cost of research projects which represent original investigation for the advancement of scientific knowledge and which do not have specific immediate commercial objectives, (although they may be in the fields of present or potential interest to the reporting company).

Item 3.A.2.a - Applied Research

Include the cost of research projects which represent investigation in discovery of new scientific knowledge and which have specific commercial objectives with respect to either products or processes.

Item 3.A.2.b - Development

Include the cost of projects which represent technical activity concerned with non-routine problems encountered in translating research. Include the findings or other general scientific knowledge into products or process.

Include as development:

- The design and operation of pilot plants and semiwork plants
- Engineering activity required to advance the design of a product or process so it meets specific functional and economic requirements
- Design, construction, and testing of prototypes and models
- Designs for special manufacturing equipment and tools
- Preparation of reports, drawings, formulas, specifications, standard practice instructions, or operating manuals

Exclude as development:

- Routine technical services to customers
- Toolmaking and tool tryout
- Production of detailed construction drawings and manufacturing blueprints
- Pre-production planning
- Any other items excluded from the definition of total R&D

ESTIMATING BASIC, APPLIED, AND DEVELOPMENT EXPENDITURES

If your company does not keep records that meet or can be allocated to these specific categories, estimate by:

- Isolating the projects that clearly fall in the development category. If your company fabricates products, such development activity will include the design, construction, and testing of prototypes and models. Some defense contracts typically call for several test models. If your company's research and development frequently involves the development of a "process" as in chemicals and petroleum, such development activity would include operations beyond the bench scale, primarily the design and operations of pilot plants or semiworks.
- Isolating the organizational units which have R&D activities that can be readily classified based on the function assigned to the unit. If R&D work is done in production units as well as in various laboratories, it is generally development type.
- Distributing the balance on the basis of individual projects or on the basis of other summaries of the work. Please use the definitions for basic, applied, and development given above.

Item 3.A.2.c - Total Costs for Applied Research and Development

Add line 3.A.2.a and line 3.A.2.b.

Item 3.A.3. - Total Costs for Basic and Applied Research and Development Performed Within the Company

Add line 3.A1 and line 3.A.2.c.

Item 3.B - Total Costs Incurred for R&D Performed Outside the Company Within the United States and Financed by the Company

Report payments in the form of contracts, grants, and fellowships made to other industrial firms, commercial laboratories, consultants, educational institutions, hospitals, and research institutions or other organizations for R&D activities performed for the company.

Do not include subcontracting of R&D contracts received from the Federal Government or other companies.

Item 3.C - Total Costs Incurred for Research and Development Performed by Foreign Subsidiaries or by Other Organizations Outside of the United States and Financed by the Company

FOREIGN SUBSIDIARIES are those outside of the 50 States and the District of Columbia.

Report the amount of R&D financed by the U.S. parent or its foreign subsidiaries, including Canada and Puerto Rico, and performed by company R&D laboratories, branch plants, or other organizations, located outside the United States.

Exclude R&D activities performed by foreign subsidiaries which were financed by foreign governments or other outside organizations

Item 3.D - Total-Company and Other Funds, Except Federal

With the exception of "Other funds," this number represents company sponsored R&D performed within the company. It is comparable to information reported on Form 10K if you report to the Securities and Exchange Commission.

To complete this item, add line 3.A.3, line 3.B and line 3.C.

SOURCE OF FUNDS

Item 3 - FEDERAL FUNDS - (Columns 1+4)

Include:

- Amount of work done on Federal R&D contracts or subcontracts in the current year
- R&D portions of procurement contracts or subcontracts

Exclude:

- Federal R&D contracts and R&D portions of procurement contracts that you subcontracted to other R&D organizations (including these would cause duplication in the statistical totals, which include data on work actually performed by each company).
- If your company performs independent research and development (IR&D), please read the following carefully:

- Definition of IR&D - We define IR&D funds as expenditures that are reimbursable by the government for qualified projects that usually have potential interest to the Department of Defense or other agencies of the Federal government. These IR&D funds are not included in work done under a research contract with the government. They are reimbursed to the company through indirect charges to the government for the purchase of products or services.

HOW TO REPORT

Report expenditures for which you anticipate reimbursement as company funds in column 5. Report expenditures in the period for which they are incurred. Do not include the actual reimbursement.

Item 3 - COMPANY AND OTHER FUNDS

(Columns 2+5) Report all company-sponsored research and development performed within the company. Report R&D performed under contract from non-federal sources.

Item 4 - COMPANY AND OTHER FUNDS, EXCEPT FEDERAL, FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BUDGETED FOR THE YEAR 1994

Report the estimated cost of company and other non-federally sponsored R&D that will be performed within the 50 States and the District of Columbia. This item is comparable to the 1993 figure reported in item 3.A.3, column 5.

Section II - RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE DOMESTIC COMPANY

Item 5 - COSTS INCURRED FOR FEDERAL RESEARCH AND DEVELOPMENT BY PRINCIPAL AGENCY

Distribute the cost of Federal research and development work (item 3A, line 3, columns 1 and 4) by Federal agency - If exact figures are not available by agency, please estimate or apportion according to the number of scientists and engineers working on the Federal projects and/or the costs of Federal programs.

Item 6 - COSTS INCURRED FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BY MAJOR TYPE OF EXPENSE

If most R&D is performed in units where summaries are regularly prepared by element of cost, base the breakdown of research and development costs upon the records of such units. If existing records do not yield figures for this item, the item may be estimated.

Item 6.1 - Wages and Salaries

Report the gross earnings paid in calendar year 1993 to employees engaged in R&D (follow the definition of salaries and wages that is used for calculating the withholding tax). Include salaries of officers in the research establishment(s) if a corporation; exclude payments to proprietor or partners if an unincorporated concern. (Scientists and engineers are defined in item 2.) Exclude employee fringe benefits which are to be reported in item 6.3 - Other Costs.

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Item 6.2 – Materials and Supplies

Report the delivered cost for all purchased materials consumed, whether received from other companies, withdrawn from inventory, or received from other establishments of this company. Include all work that was done for your laboratories and other technical units by non company organizations (for example, model construction by a non company model shop). Exclude purchases from other R&D organizations.

Item 6.3 – Other Costs

Include items related to your R&D activities and not included in items 6.1 and 6.2. Include utilities, books and periodicals, property and other taxes, employee fringe benefits, and company overhead.

Item 7 – FIELDS OF BASIC RESEARCH

Use the following definitions to help you divide your company's basic research into broad research fields.

Item 7.1– Chemistry

Includes inorganic, organo-metallic, organic, and physical.

Item 7.2 – Engineering (Including metallurgy)

Includes aeronautical (including aerospace and space technology), chemical, nuclear, civil, electrical, and mechanical engineering, etc.) and metallurgy and materials.

Item 7.3 – Geological Sciences

Includes geodesy, hydrology, geochemistry, seismology, soil sciences, etc.

Item 7.4 – Mathematics

Includes areas such as algebra; foundations and logic; geometry; numerical analysis, etc.

Item 7.5 – Computer Sciences

Includes activities directed toward enhancing the understanding of computer structures and computational processes to provide bases for the future capabilities for computational solutions of presently intractable problems.

Item 7.6 – Physics

Includes acoustics; atomic and molecular; condensed matter; elementary particle; nuclear structure; optics; plasma.

Item 7.7 – Astronomy

Includes laboratory astrophysics; optical astronomy; radio astronomy; theoretical astrophysics; Gamma-ray, neutrino astronomy.

Item 7.8 – Atmospheric Sciences

Includes aeronomy; solar; weather modification; extraterrestrial atmospheres; meteorology.

Item 7.9 – Oceanography

Includes biological oceanography; chemical oceanography; physical oceanography; marine geophysics.

Item 7.10 – Biological Sciences

Includes all sciences (other than clinical medical sciences) which deal with life processes, including plant and animal sciences, biochemistry, cell biology, nutrition, microbiology, physiology, etc.

Item 7.11 – Clinical Medical Sciences

Includes all sciences concerned with the use of scientific knowledge for the identification, treatment, and cure of disease including internal medicine, neurology, preventive medicine and public health, pathology, pharmacology, psychiatry, dentistry, veterinary medicine, etc.

Item 7.12 – Other Sciences

To be used for multidisciplinary and interdisciplinary projects which cannot be classified within one of the above primary fields of science.

Item 7.13 – Total Basic Research Costs

This should be the same as Item 3.A.1., columns 3 and 6.

Item 8 – APPLIED RESEARCH AND DEVELOPMENT BY PRODUCT CLASS PERFORMED WITHIN THE COMPANY

Enter both Federal and total cost of applied R&D by product group. Costs should be entered in the field which is the END PRODUCT for the firm performing the R&D. For example, R&D in very large scale integrated (VLSI) circuits would be reported by a semiconductor firm on line 25, electrical industrial apparatus, if the chips are the final product sold by the firm. The same type of microelectronic R&D by a computer firm, however, would be reported on line 22, office, computing and accounting machines, if the chip are intended to be part of a computer which is the firm's end product.

Definitions for various fields of applied R&D are listed in the instructions for items 8.1 through 8.37. For those companies familiar with the Standard Industrial Classification (SIC), the 1987 SIC codes are given after each title. Note that the SIC definition here applies to each field of R&D and effort, and not necessarily to the overall code in which your company's manufacturing output is classified.

Report cost of Federally funded applied R&D by product group in column 1, and total cost of applied R&D by product group (also including Federal) in column 2.

How To Report Atomic Energy Devices:

- Radioactive isotopes and other radiation sources should be reported in line 8.5.
- Partially fabricated reactor fuel element materials and control rods should be reported in line 8.14.
- Nuclear reactors; reactor components and equipment; core structurals; heat exchangers and condensers; valves; complete reactor fuel elements and control rods for use in propulsion, power plants, and other; and atomic waste casks should be reported in line 8.17.
- Fuel handling equipment, control rod drive mechanism and components for power plants, propulsion, and other; pressurizers, components, and auxiliary equipment; and pumps should be reported in line 8.23.
- Atom smashers (particle accelerators) should be reported in line 8.29.
- Accessory instrumentation for reactor control should be reported in line 8.34.
- Hot laboratory equipment and special instrumentation should be reported in line 8.35.

Item 8.1 – Food and Kindred Products (SIC 20)

Foods and beverages for human consumption and certain related products such as vegetable and animal fats and oils, and prepared feeds for animals and fowls.

Item 8.2 – Textile and Mill Products (SIC 22)

Mill preparation of fibers and mill manufacture of yarn, thread, twine etc; manufacture of broadwoven and knit.

Item 8.3 – Lumber and Wood Products (SIC 24)

Includes cutting timber and pulpwood: merchant sawmills, lath mills, shingle mills, cooperage stock mills, planing mills, and plywood mills and veneer mills engaged in producing lumber and wood basic materials; and establishments engaged in manufacturing finished articles made entirely or mainly of wood or related materials.

Item 8.4 – Paper and Allied Products (SIC 26)

Includes manufacturing of pulps from wood and other cellulose fibers, and from rags; the manufacture of paper and paperboard; and the manufacture of paper and paperboard into converted products, such as paper coated off the paper machine, paper bags, paper boxes, and envelopes. Also included are establishments primarily engaged in manufacturing bags of plastic film and sheet.

Item 8.5 – Industrial Inorganic and Organic Chemicals (SIC 281 and 286)

Includes alkalies and chlorine, industrial gases, inorganic pigments, and industrial inorganic chemicals not elsewhere classified (n.e.c.). Also includes industrial organic chemicals including gum and wood chemicals, cyclic crudes, and cyclic intermediates, dyes, and organic pigments, and other industrial organic chemicals n.e.c. Includes radioactive isotopes and other radiation sources.

Item 8.6 – Plastics Materials and Synthetic Resins, Synthetic Rubber, Synthetic and Other Manmade Fibers (SIC 282)

Includes cellulosic and noncellulosic fibers. Excludes glass which should be included in product group 13.

Item 8.7 Drugs (SIC 283)

Medicinal chemicals, biological and botanical products, and pharmaceutical preparations.

Item 8.8 – Agricultural Chemicals (SIC 287)

Fertilizers, agricultural pesticides, and other agricultural chemicals.

Item 8.9 – All Other Chemicals (Balance of SIC 28)

Includes explosives, soaps, glycerins, detergents and cleaning preparations, paints and varnishes, toilet preparation, and miscellaneous chemical products.

Item 8.10 – Petroleum Refining and Related Industries, Oil and Gas Extraction (SIC 13 and 29)

Excludes geological and geophysical exploration activities.

Item 8.11 – Rubber and Miscellaneous Plastics Products (SIC 30)

Fabricated rubber such as industrial and mechanical rubber goods and fabricated plastics products.

Item 8.12 – Leather and Leather Products (SIC 31)

Includes tanning, currying, and finishing hides and skins, leather converters, and establishments manufacturing finished leather and artificial leather products and some similar products made of other materials.

Item 8.13 – Stone, Clay, Glass, and Concrete Products (SIC 32)

Ceramics, glass, clay products, abrasives and asbestos products, cement, stone products, concrete products, and other nonmetallic mineral products.

Item 8.14 – Primary Ferrous Products (SIC 331, 332, 3399, and 3462)

Products of blast furnaces, steel works, rolling and finishing mills, iron and steel castings and forgings. Includes partially fabricated reactor fuel element materials and control rods.

Item 8.15 – Primary and Secondary Nonferrous Metals (Balance of SIC 33 and 346)

Primary and secondary smelting and refining of nonferrous metals, rolled, drawn, and extruded nonferrous metals products, castings and forgings.

Item 8.16 – Ordnance, Except Missiles (SIC 348, 3795)

Artillery, small arms, ammunition, tanks and parts, etc.

Item 8.17 - Fabricated Metal Products (SIC 34 Except 3462, 3463, and 348, Ferrous and Nonferrous Forgings, Ordnance)

Tinware, hand tools, nonelectric heating apparatus, fabricated structural metal products, metal stampings, fabricated wire products, etc., core structural (barrels, cans, boxes, plates, etc.); heat exchangers, steam and barometric condensers, and valves; and nuclear reactors, reactor components and equipment.

Item 8.18 - Engines and Turbines (SIC 351)

Steam engines, steam gas and hydraulic turbines, diesel and other internal combustion engines, n.e.c.

Item 8.19 - Farm and Garden Machinery and Equipment (SIC 352)

Farm machinery, including tractors for farm use.

Item 8.20 - Construction, Mining, and Materials Handling Machinery and Equipment (SIC 353)

Construction mining and oil field machinery and equipment, elevators, conveyors, hoists, industrial trucks, tractors, trailers, and stackers.

Item 8.21 - Metal working Machinery and Equipment (SIC 354)

Machine tools, dies, machine tool accessories, rolling mill machinery, power-driven hand-tools, and wire fabricating machinery and equipment.

Item 8.22 - Office, Computing, and Accounting Machines (SIC 357)

Electronic computing equipment; calculating and accounting machines; typewriters; other computing and office machines (except laboratory scales and balances).

Item 8.23 - Other Machinery, Except Electrical (Balance of SIC 35)

Special industrial machinery, except metalworking, such as food products machinery, textile and paper industries machinery, general industrial machinery and equipment, and miscellaneous machinery except electrical. Includes pumps, air and gas compressors, and industrial process furnaces and ovens. Includes atomic fuel holding equipment; control rod drive mechanism and components for use on nuclear reactors.

Item 8.24 - Electric Transmission and Distribution Equipment (SIC 361 and 3825)

Electric measuring instruments and test equipment power, distribution and specialty transformers, switchgear and switchboard transformers, etc.

Item 8.25 - Electrical Industrial Apparatus (SIC 362)

Electric motors and generators, motor starters and controls, carbon and graphite brushes, electrodes. Nonelectronic capacitors, condensers, and rectifiers.

Item 8.26 - Radio and Television Receiving Equipment, Except Communication Types (SIC 365)

Radio and television sets, home recorders, prerecorded magnetic tapes, microphones, speaker systems, turntables, phonograph records, compact disc players, etc.

Item 8.27 - Communications Equipment (SIC 366)

Telephone and telegraph apparatus, radio and television transmitting, signaling, and detection equipment and apparatus.

Item 8.28 - Electronic Components and Accessories (SIC 367)

Semiconductors, computer logic modules, computer chips, solid state electronic devices, integrated circuits, electronic capacitors, transformers, connectors, cathode ray tubes, solar cells, solid state photovoltaic devices, etc.

Item 8.29 - Other Electrical Machinery Equipment and Supplies (Balance of SIC 36)

Household appliances, electric lighting and wiring equipment, atom smashers, and miscellaneous electrical machinery, equipment and supplies.

Item 8.30 - Motor Vehicles and Equipment (SIC 371)

Motor vehicles such as ambulances, fire engines, personnel carriers, amphibian motor vehicles, truck and automobile trailers, and motor vehicle parts and accessories.

Item 8.31 - Aircraft and Parts (SIC 372)

Piloted and unpowered aircraft and parts of all types, including engines and auxiliary equipment such as landing gear, de-icing equipment, and other auxiliary equipment specifically adopted for aircraft. Exclude radar and radio equipment, electronic sighting devices and aeronautical instruments which should be reported in product group 32.

Item 8.32 - Missiles and Space Vehicles (SIC 376)

Include frames or structures launching and handling support equipment and work on the missile system and space as a whole. Exclude electronic guidance control subassemblies and radar which should be reported in product group 35.

Item 8.33 - Other Transportation Equipment (Balance of SIC 37 Except 3795)

Ship building, boat building and repairing, railroad equipment, motorcycles, bicycles, and parts, etc. Exclude tanks and tank components which are in product group 16.

Item 8.34 - Scientific and Mechanical Measuring Instruments (SIC 381, 382 Part)

Engineering, laboratory, scientific, and research instruments, and associated equipment; automatic controls for regulating residential and commercial environments and appliances; industrial instruments for measurement, display, and control of process variables; nonelectric fire detecting systems, totalizing fluid meters and counting devices; instruments for measuring and testing electricity and electrical signals, and radar systems and equipment; accessory instrumentation for reactor control.

Item 8.35 - Optical, Surgical, Photographic, Timing and Other Instruments (Balance of SIC 38, SIC 382 Part)

Optical instruments and lenses; surgical and medical instruments and apparatus; dental equipment and supplies; ophthalmic goods including contact lenses; optical fire control equipment; photographic equipment and supplies including film and motion picture apparatus; watches, clocks, clockwork operated devices and parts, appliance timers, chronometers.

Item 8.36 - Computer Programming, Data Processing, and Other Computer Related Services (SIC 737)

Includes computer programming services, prepackaged software, computer integrated systems design, computer processing and data preparation and processing services, information retrieval services, computer facilities management services, computer rental and leasing, computer maintenance and repair.

Item 8.37 - Other

Please write-in category.

Item 9 - COST OF RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY, BY STATE

Report the cost of R&D for each State in which your company has research and development laboratories or facilities. It is not necessary to calculate separately individual assignments which may be made outside the home State of a particular research staff.

As much as 10 percent of the total may, if desired, be reported in line 52 as "Not distributed by State."

Item 10 - ENERGY RESEARCH AND DEVELOPMENT

Include all spending for R&D to increase energy resources or capabilities, including the development of energy equipment. Energy research and development can include costs of R&D projects (both product and process) on exploration, extraction, transportation, processing, storage, generation (including conversion), distribution, conservation, etc., of present, new, or improved forms of energy. Record energy R&D spending according to type of energy in Items 10A through 10E.

If R&D spending is for joint or multiple purposes, estimate and report the portion of cost incurred for the energy purpose. In the limited number of cases where the separation of joint (multiple) costs by type of energy cannot be estimate, include the total cost of the R&D project when the primary purpose of the project is energy research and development. If the project is not primarily for energy research and development then exclude all of the project cost.

Item 10B4 - "Coal"

"Synthetic fuels" includes programs designed to convert coal to gaseous and liquid products. "Mining" is composed of programs for developing equipment and techniques to improve the productivity and recovery rates of coal mining.

Item 10C3 - "Conservation and Utilization"

Includes R&D activities undertaken to reduce consumption either at the point of energy use or in the transmission, transportation, storage, and conversion of energy. Examples of such are R&D undertaken primarily to reduce fuel consumption in manufacturing, to improve the efficiency of transportation of energy products, or to produce an end product which is more efficient in energy consumption.

Item 10D - "All Other Energy"

Includes areas such as wind, waste, hydroelectric, etc. Also include in this category the development of energy equipment which cannot be readily classified in Items 10A through 10C.

Item 11 - POLLUTION ABATEMENT RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY

Includes R&D spending for the purpose of reducing or eliminating the emission of pollutants. "Pollution" refers to the emission of pollutants to the outside of a firm's property or activities; "abatement" includes prevention, treatment, or recycling.

Exclude costs:

- to contribute to environmental aesthetics
- to increase equipment durability in corrosive environments
- to conserve energy (include as energy R&D in item 5.3.)
- to conserve natural resources
- to increase employee comfort, safety, and health

If the only purpose of the R&D spending is pollution abatement, include the total expenditures on the project. If pollution abatement is only one of several purposes, report only the R&D costs associated with pollution abatement. When the separation of joint costs is not feasible, include the total R&D costs for a project if the purpose is primarily (more than 50 percent) for pollution abatement.

If the project is not primarily for pollution abatement purposes, exclude all of the project costs. Also exclude project costs if expected pollution abatement benefits are obtained at no extra cost.

Item 11A - Air

1. Automotive emissions includes all R&D efforts undertaken to reduce exhaust emissions from automobiles.
2. Electric power plants emissions includes efforts directed toward reducing airborne emissions from electric power plants.
3. "All other" includes efforts directed at removing sulfur oxide, nitrogen oxides and particulates, and other fossil-fuel pollutants from the atmosphere.

Item 11B - Water

Includes R&D spending on water recirculation or thermal pollution abatement, etc.

Item 11C - Solid Waste

Includes R&D spending on waste compacting devices, etc.

Item 11D - Other

Includes R&D spending on pollution abatement from noise and radiation, etc.

Section III - RESEARCH AND DEVELOPMENT PERFORMED OUTSIDE THE DOMESTIC COMPANY WITH COMPANY FUNDS

This section of the report form covers the R&D reported in item 3.C of section I, on page one.

Item 12 - FOREIGN RESEARCH AND DEVELOPMENT BY COUNTRY AND EXPENDITURE

Allocate the totals reported in Item 3.C., column 5 by the country in which your various research and development takes place. Estimate the costs associated with each country. If necessary, you may write in countries not listed.

Item 13 - COVERAGE AND OPERATIONAL STATUS**Item 13A**

Check the appropriate box if the domestic company expenditures on this form, including all subsidiaries, have R&D. If no, please explain in remarks section or in a transmittal letter.

Item 13B

Check the appropriate box if this company was owned or controlled by another company on December 31, 1993. If yes, provide date of the organizational change.

Item 13C

Provide the name and address of the new owner. In the "Remarks" section, specify change or correction, e.g., wholly-owned subsidiary of ABC Company, "merger with XYZ Company", "acquired by 123 Corporation".

Item 14 - CERTIFICATION

Report the name and telephone number of the person to contact regarding this report.

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FORM **RD-1A**
(1-18-94)U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS

NOTICE — Your report to the Census Bureau is **confidential** by law (title 13, U.S. Code).

**SURVEY OF INDUSTRIAL RESEARCH AND
DEVELOPMENT DURING 1993**

The instructions and definitions on this form are not complete. Please read the enclosed instruction sheet before completing this form.

In correspondence pertaining to this report refer to this **CENSUS FILE NUMBER (11 digits)** ►

RETURN TO

BUREAU OF THE CENSUS
1201 East 10th Street
Jeffersonville, IN 47132-0001

Data supplied in item 1 and in item 3A.3, columns 1 and 3 for 1993 on this form will satisfy the mandatory reporting requirements (title 13, U.S. Code).

FROM THE ACTING DIRECTOR
BUREAU OF THE CENSUS

The Bureau of the Census conducts the "Survey of Industrial Research and Development" under sponsorship of the National Science Foundation. We appreciate your cooperation in reporting the requested information. Each year we select a new sample of firms to distribute the amount of burden placed on respondents and to ensure an accurate representation of all the firms.

Enclosed are the instructions for completing the report form and a letter from the National Science Foundation emphasizing the survey's prominence. The 1993 report covers your entire domestic company operations.

The law (title 13, United States Code) authorizes this report. Your response is mandatory for item 1 and item 3A.3, columns 1 and 3. We need your voluntary cooperation in reporting the remaining items to make the results of the survey comprehensive and accurate. We recognize you may not maintain book records for particular items. In such cases please use carefully prepared estimates.

By section 9 of the same law (title 13), your report to the Bureau of the Census is confidential. Only sworn Bureau of the Census employees will see the information you reported, and they will use it only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.

Please return the completed form within 60 days. If you have questions concerning this survey, need copies of the form, or need additional time, please call the Special Surveys Branch of our Industry Division on (301) 763-5598. We thank you for your cooperation in this vital survey.

Sincerely,



Harry A. Scarr

Enclosures

PLEASE OPEN AND BEGIN THE SURVEY WITH ITEM 1.

GENERAL INSTRUCTIONS

Please complete this form and return within 60 days in the envelope provided. Make a copy for your records. THIS REPORT SHOULD COVER YOUR ENTIRE COMPANY, INCLUDING ALL SUBSIDIARIES, UNLESS OTHERWISE DESIGNATED.

Enter 0 (zero) where appropriate rather than leaving a blank space.

Reasonably accurate estimates are acceptable.

If your company is a nonprofit organization, please indicate so in remarks section and return the form. If this form has been directed to a trust or pension plan which performs no activity other than investments, do not report. Please note in remarks and return the form.

Item 1 - SALES AND EMPLOYMENT FOR COMPANY

- A. INCLUDE** sales of products and services to other companies, individuals, U.S. Government agencies, and foreign countries from all domestic operations of your company.

Domestic sales and receipts of this company**1993**

Bil.	Mil.	Thou.	Dol.
102			
\$			000

- B.** Total domestic company employment in all activities during the pay period which includes the 12th of March 1993. (Item 1 of Treasury Form 941, if one Form 941 was filed for the entire company.)

Domestic employment**1993**

Number

112

RESEARCH AND DEVELOPMENT - R&D

Includes basic and applied research in the sciences and in engineering, and design and development of prototype products and processes.

For the purposes of this survey, research and development includes activities carried on by persons trained, either formally or by experience, in the physical sciences including related engineering, and the biological sciences including medicine but excluding psychology, if the purpose of such activity is to do one or more of the following things:

1. Pursue a planned search for new knowledge, whether or not the search has reference to a specific application. (Basic Research)

2. Apply existing knowledge to problems involved in the creation of a new product or process, including work required to evaluate possible uses. (Applied Research)
3. Apply existing knowledge to problems involved in the improvement of a present product or process. (Development)

Research and development includes the activities described above whether assigned to separate R&D organizational units of the company or carried out by company laboratories and technical groups not part of an R&D organization. Reporting the R&D activities of such latter groups may require the use of estimates for some of the questions.

See instructions for more detail.

Item 2 - CHECK FOR RESEARCH AND DEVELOPMENT

Mark (X) the appropriate box.

- 201 ☐ Company had R&D in 1993 - Complete form, enter zeros where applicable, and return this form.
- 202 ☐ Company had no R&D in 1993, but has in the past and may in the future - Go to item 7, sign, and return this form.
- 203 ☐ Company does not conduct R&D - Go to item 7, sign, and return this form.

A. WITHIN THE COMPANY – Costs incurred for research and development performed within the company by major type and source of funds (Should be excluded from B and C)		Federal funds				Company and other				Total ((1) + (2))			
		(1)				(2)				(3)			
		Bil.	Mil.	Thou.	Dols.	Bil.	Mil.	Thou.	Dols.	Bil.	Mil.	Thou.	Dols.
1. Basic research	300 ☐	304				305				306			
If "None," please mark (X) → ☐		\$			000	\$			000	\$			000
2. Applied research and development	a. Applied research	314				315				316			
		\$			000	\$			000	\$			000
	b. Development	324				325				326			
		\$			000	\$			000	\$			000
	c. Total (Sum of lines a and b) →	334				335				336			
		\$			000	\$			000	\$			000
3. TOTAL (Sum of 1 and 2c) →		344				345				346			
		\$			000	\$			000	\$			000
B. Outside the company – Total company funds for research and development activities financed by the company but performed by others outside the company within the United States (Should be excluded from A3)						365							
						\$			000				
C. Foreign – Total company funds for research and development activities performed by foreign subsidiaries or by other organizations outside the United States (Should be excluded from A3)						366							
						\$			000				
D. TOTAL – Company and other funds, except Federal (This line represents company sponsored research and development with the exception of "other funds." (Sum of A3, B, and C) →						375							
						\$			000				
Item 4 – COMPANY AND OTHER FUNDS, EXCEPT FEDERAL FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BUDGETED FOR THE YEAR 1994						Bil.	Mil.	Thou.	Dols.				
						401							
						\$			000				

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Item 5 - NUMBER OF RESEARCH AND DEVELOPMENT SCIENTISTS AND ENGINEERS

Includes all persons engaged in scientific or engineering work at a level which requires a knowledge of physical or life sciences, engineering, or mathematics equivalent to completion of a 4-year college course of study with a major in these fields, regardless of whether or not they actually hold a degree in this field.

Report the full-time equivalent number of R&D scientists and engineers on the rolls in January 1994. For employees whose activities are not solely devoted to research and development, report the proportion of their time that is devoted to research and development. (See instructions for examples)

January 1994

Number

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Item 6A - COVERAGE AND OPERATIONAL STATUS

Are research and development expenditures for entire domestic company, including subsidiaries reported on this form?

☐ Yes

☐ No - Please explain in remarks or on transmittal letter.

Was this company owned or controlled by another company on December 31, 1993?

☐ Yes - Complete 6B. Date acquired

☐ No

Month	Year

601

Item 6B - NEW OWNER OR OPERATOR

602 Name

603 Address

604 City

605 State

606 ZIP Code

Item 7 - CERTIFICATION - This report is substantially accurate and has been prepared in accordance with instructions.

Name of person to contact regarding this report

Telephone →

Area code

Number

Extension

Signature of authorized official

Title

701 Date

801 REMARKS

INSTRUCTIONS AND DEFINITIONS FOR SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1993 FORM RD-1A

GENERAL INSTRUCTIONS

Please complete and return this form in the envelope provided within 60 days. Make a copy for your records.

INTRODUCTION - Comprehensive and timely information about the nature and support of corporate research and development activities is an important component in the overall assessment of our nation's scientific and technological resources. The information you provide is used to prepare national measures of industrial research and development (R&D) not available from any other source. By carefully completing this report, the accuracy of this information is ensured.

SURVEY SCOPE - This report covers privately-owned nonfarm business firms in all sectors of the United States economy. It does not include operations owned by Federal, State or local governments, or nonprofit organizations.

If your company is a nonprofit organization, please indicate so in the remarks section and return the form.

If this form has been directed to a trust or pension plan which performs no activity other than investments, do not report. Please note in remarks section and return the form.

REPORTING ENTITY - Report R&D for all domestic operations of your company, including subsidiaries and divisions. Report for all parts of the company that are located in the 50 States and the District of Columbia. Report sales and employment figures for all parts of the company, even those that do not perform R&D, as long as they are located in the 50 States or the District of Columbia.

If this form has been directed to a holding company, report for all subsidiaries and operations under the ownership and control of the holding company.

ESTIMATES ARE ACCEPTABLE - If you cannot answer a question from your company records, please estimate the answer carefully.

HOW TO REPORT - Report all value figures in thousands of dollars.

Example: 1,123,678,599 dollars.

	Bil.	Mil.	Thou.	Dol.
Report	\$1	123	679	000

If you estimate your answers in millions of dollars, please fill the thousands box with zeros.

Example: 1,124 million dollars.

	Bil.	Mil.	Thou.	Dol.
Report	\$1	124	000	000

Enter "0" where appropriate rather than leaving a blank space.

PERIOD COVERED BY THE REPORT - Figures should be reported on a calendar year basis. Fiscal year data are acceptable for all items except for employment, provided your fiscal year ends between September and March. Please report employment figures (Items 1B and 5) for the specific time indicated for both of these items.

ADDITIONAL FORMS - Photocopies of this form are acceptable. If you require additional forms, write to the Bureau of the Census, 1201 East 10th Street, Jeffersonville, IN 47132-0001 or call (812) 288-3331.

FILING EXTENSIONS - If you cannot complete the survey in 60 days, request an extension of time by writing to the address below (please include your Census File Number):

Bureau of the Census
1201 East 10th Street
Jeffersonville, IN 47132-0001

or call: (812) 288-3331.

ALTERNATIVE REPORTING FORMATS - For information concerning use of reporting formats other than the form provided, such as computer tape, diskette, or printouts, contact Mr. Jesse Havard on (301) 763-5915.

BURDEN HOUR ESTIMATE - Public reporting burden for this collection of information is estimated to average 1 hour per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimates or any other aspects of this collection of information including suggestions for reducing this burden to Herman G. Fleming, National Science Foundation 4201 Wilson Boulevard, Arlington, VA 22230; and to the Office of Information and Regulatory Affairs, Office of Management and Budget (OMB No. 3145-0027), Washington, DC 20503.

Direct any **QUESTIONS** regarding this form to the Bureau of the Census, ATTN: Industry Division, Washington, DC 20233-0001, or call (301)763-5598.

DEFINITIONS OF RESEARCH AND DEVELOPMENT - R&D includes basic research and applied research in the sciences and in engineering, and design and development of prototype products and processes.

For the purposes of this study, R&D includes activities carried on by persons trained, either formally or by experience, in the physical sciences including related engineering,

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and the biological sciences including medicine but excluding psychology, if the purpose of such activity is to do one or more of the following things:

1. Pursue a planned search for new knowledge, whether or not the search has reference to a specific application.
2. Apply existing knowledge to problems involved in the creation of a new product or process, including work required to evaluate possible uses.
3. Apply existing knowledge to problems involved in the improvement of a present product or process.

Research and development includes the activities described above whether assigned to separate R&D organizational units of the company or carried out by company laboratories and technical groups not part of an R&D organization. Reporting the R&D activities of such latter groups may require the use of estimates for some of the questions.

Activities to be excluded from R&D:

- Routine product testing
- Geological and geophysical exploration activities
- Technical services such as:
 - Quality and quantity control
 - Technical plant sanitation control
- Trouble-shooting in connection with breakdowns in full-scale production
- Advertising programs to promote or demonstrate new products or processes
- Assistance in preparation of speeches and publications for persons not engaged in research and development.
- Research in social sciences and psychology - social science. R&D is defined to encompass those activities devoted to understanding the behavior of groups of human beings or of individuals as members of groups. Some of the topics include the following:
 - Personnel R&D
 - Economic R&D
 - Artificial intelligence and expert systems R&D
 - Consumer, market, and opinion R&D
 - Engineering psychology R&D
 - Management and organization R&D
 - Actuarial and demographic R&D
 - Educational processes and applications R&D
 - R&D in law
 - Software development

SPECIFIC INSTRUCTIONS

Item 1 - SALES AND EMPLOYMENT FOR THE COMPANY

Item 1A - Domestic Sales and Receipts

Sales and receipts are defined as the revenue for goods produced, distributed, or services provided. Include revenue from investments, rents, and royalties only if it is the principal business of the company. The reported figures should represent net value f.o.b. plant after discount and allowances and should exclude freight charges and excise taxes.

Include:

- All operating receipts from taxable operations, as well as total revenue from tax-exempt activities

- Sales of products and services to other companies, individuals, U.S. Government agencies, and foreign countries
- Transfers to foreign subsidiaries

Exclude:

- Domestic intra-company transfers
- Sales by foreign subsidiaries

Item 1B - Domestic Employment

Report the number of employees of the company in all activities in the 50 States and the District of Columbia during the pay period which includes March 12, 1993. This figure would be the same as Item 1 of Treasury Form 941, if one Form 941 was filed for the entire company. Report number of employees, not payroll.

Item 2 - CHECK FOR RESEARCH AND DEVELOPMENT

Check the box that best describes the R&D activities of your company.

Item 3 - REPORT COSTS INCURRED FOR RESEARCH AND DEVELOPMENT

Include as costs:

- Wages, salaries, and related costs
- Materials and supplies consumed
- R&D depreciation
- Cost of computer software used in R&D activities
- Total charges for work done on contract, including profit
- Utilities, such as telephone, telex, electricity, water, and gas
- Travel costs and professional dues
- Property taxes and other taxes (except income taxes) incurred on account of the R&D organization or the facilities they use
- Insurance expenses
- Maintenance and repair, including maintenance of buildings and grounds
- Company overhead including: personnel, accounting, procurement and inventory, and salaries of research executives not on the payroll of the R&D organization

Exclude as cost:

- R&D performed abroad (outside the continental U.S.) such as in Canada and Puerto Rico (Except in Item 3.C.)
- R&D performed by non-company R&D organizations of any kind (Except in Item 3.B.)
- Capital expenditures
- Patent expense
- Income taxes and interest
- The portion of company-held R&D contracts that were subcontracted outside the reporting company
- Fellowships, grants, and gifts to promote R&D or the study of science and engineering
- Social Science R&D

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Item 3.A - Report Costs Incurred for Research and Development Performed Within the Company

Federally sponsored R&D performed within the company should be reported in column 1.

Costs of company sponsored R&D performed within the company, or R&D performed within the company under contract from non-federal sources should be reported in column 2.

Costs of INDEPENDENT R&D should also be reported in column 2. For the purpose of this survey, INDEPENDENT R&D is defined as R&D performed by the company for which you anticipate reimbursement by the government through indirect charges for the purchase of products or services.

TYPES OF RESEARCH

Item 3.A.1 - Basic Research

Include the cost of research projects which represent original investigation for the advancement of scientific knowledge and which do not have specific immediate commercial objectives (although may be in the fields of present or potential interest to the reporting company).

Item 3.A.2.a - Applied Research

Include the cost of research projects which represent investigation in discovery of new scientific knowledge and which have specific commercial objectives with respect to either products or processes.

Item 3.A.2.b - Development

Include the cost of projects which represent technical activity concerned with non-routine problems encountered in translating research findings or other general scientific knowledge into products or process.

Include as development:

- The design and operation of pilot plants and semiwork plants
- Engineering activity required to advance the design of a product or process so it meets specific functional and economic requirements
- Design, construction, and testing of prototypes and models
- Designs for special manufacturing equipment and tools
- Preparation of reports, drawings, formulas, specifications, standard practice instructions, or operating manuals

Exclude as development:

- Routing technical services to customers
- Toolmaking and tool tryout
- Production of detailed construction drawings and manufacturing blueprints
- Pre-productions planning
- Any other items excluded from the definition of total R&D

ESTIMATING BASIC, APPLIED, AND DEVELOPMENT EXPENDITURES

If your company does not keep records that meet or can be allocated to these specific categories, estimate by:

- Isolating the projects that clearly fall in the development category. If your company fabricates products, such development activity will include the design, construction, and testing of prototypes and models. Some defense contracts typically call for several test models. If your company's research and development frequently involves the development of a "process" as in chemicals and as in chemicals and petroleum, such development activity would include operations beyond the bench scale, primarily the design and operations of pilot plants or semiworks.
- Isolating the organizational units which have R&D activities that can be readily classified based on the function assigned to the unit. If R&D work is done in production units as well as in various laboratories, it is generally development type.
- Distributing the balance on the basis of individual projects or on the basis of other summaries of the work. Please use the definitions for basic, applied, and development given above.

Item 3.A.2.c - Total Costs for Applied Research and Development

Add line 3.A.2.a and line 3.A.2.b.

Item 3.A.3 - Total Costs for Basic and Applied Research and Development Performed Within the Company

Add line 3.A.1 and line 3.A.2.c.

Item 3.B - Total Costs Incurred for R&D Performed Outside the Company Within the United States and Financed by the Company

Report payments in the form of contracts, grants, and fellowships made to other industrial firms, commercial laboratories, consultants, educational institutions, hospitals, and research institutions or other organizations for R&D activities performed for the company.

Do not include subcontracting of R&D contracts received from the Federal Government or other companies.

Item 3.C - Total Costs Incurred for Research and Development Performed by Foreign Subsidiaries or by Other Organizations Outside of the United States and Financed by the Company

FOREIGN SUBSIDIARIES are those outside of the 50 States and the District of Columbia.

Report the amount of R&D financed by the U.S. parent or its foreign subsidiaries, including Canada and Puerto Rico, and performed by company R&D laboratories, branch plants, or other organizations, located outside the United States. Report R&D activities of foreign divisions and subsidiaries in Item 3.C only.

Exclude R&D performed by foreign subsidiaries which were financed by foreign governments or other outside organizations

Item 3.D - Total - Company and Other Funds, Except Federal

With the exception of "Other funds," this number represents company sponsored R&D performed within the company. It is comparable to information reported on Form 10K if you report to the Securities and Exchange Commission.

To complete this item, add line 3.A.3, line 3.B and line 3.C.

SOURCE OF FUNDS

Item 3 - FEDERAL FUNDS (Column 1)

Include:

- Amount of work done on Federal R&D contracts or subcontracts in the current year
- R&D portions of procurement contracts or subcontracts

Exclude:

Federal R&D contracts and R&D portions of procurement contracts that you subcontracted to other R&D organizations (including these would cause duplication in the statistical totals, which include data on work actually performed by each company).

Item 3 - COMPANY AND OTHER FUNDS (Column 2)

Report all company-sponsored research and development performed within the company. Report R&D performed under contract from non-Federal sources.

Item 4 - COMPANY AND OTHER FUNDS, EXCEPT FEDERAL, FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BUDGETED FOR THE YEAR 1994

Report the estimated cost of company and other non-federally sponsored R&D that will be performed within the 50 States and the District of Columbia. This item is comparable to the 1993 figure reported in item 3.A.3, column 2.

Item 5 - NUMBER OF RESEARCH AND DEVELOPMENT SCIENTISTS AND ENGINEERS

Scientists and engineers are defined for this survey as all persons engaged in scientific or engineering work at a level which requires a knowledge of physical or life sciences or engineering or mathematics equivalent to completion of a 4-year college course with a major in these fields, regardless of whether or not they actually hold a degree in this field.

The figure on R&D scientists and engineers will be obtained primarily from two sources:

1. For company laboratories performing only research and development, report the number of scientists and engineers on the rolls in January.
2. For employees whose activities are not solely devoted to R&D, report the proportion of their time that is devoted to R&D. For example, if a company had the full-time equivalent of 60 scientist and engineers in January 1994 and one-fourth of their time was charged to R&D projects, the figure for the number of R&D scientists and engineers for this company would be 15.

Item 6A - Coverage and Operational Status

Indicate if this form includes R&D expenditures for entire domestic company, including subsidiaries. Indicate if this company was owned or controlled by another company on December 31, 1993.

Item 6B - New Owner or Operator

Report the date the company was acquired and the new owner's name and address information.

Item 7 - CERTIFICATION

Report the name and telephone number of the person to contact regarding this report.

NATIONAL SCIENCE FOUNDATION
ARLINGTON, VA 22230

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